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NONLINEAR ERROR ANALYSIS OF FINITE DIFFERENCE
SOLUTIONS OF TURBULENT AND UNSTEADY FLOW FIELDS

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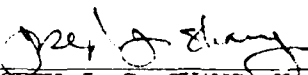
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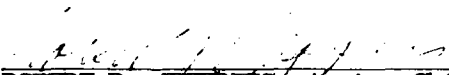
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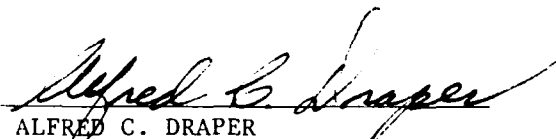
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I. Introduction

It has been increasingly apparent that we must consider the interaction between the truncation error terms present in all numerical methods and the solutions of the governing equations being integrated. Of particular importance is the effect of truncation error on solutions involving turbulence models. These models, in general, produce an effect on the mean flow similar to that produced through computing an eddy viscosity term which increases and varies viscosity. The goal of this variation of effective viscosity is to produce a mean flow profile identical to that which exists when the boundary layer is turbulent. The variation in space of the eddy viscosity models tends to produce both dissipation, which we expect, and dispersion, which we do not expect.

It will be the goal of this work to examine the interaction of the truncation error terms with solutions of the governing equations. We will first examine the interaction between the errors and fluid turbulence models and then, if time and funding permits, between the solutions and the errors due to changes in the numerical time step. Previous work, References 5 and 6, in which truncations errors were derived for selected methods and compared with numerical solutions will be used as the basis for this study. MacCormack's explicit method and the Beam-Warming implicit method are selected for this study, as these are the two most widely used methods in each category.

We will show that the leading error terms for these methods applied to a nonlinear equation, although nominally either dissipative or dispersive, in reality contain both dissipation and dispersion. This effect is demonstrated by analysis of the modified equation for Burger's equation. For a second-order

method applied to this equation, both dissipation and dispersion result from the leading error term. The implications of this fact are great for error analysis. For methods for which the magnitude of the error terms decays rapidly, we can show the next term to be a perturbation on the leading term. This means that it is only necessary to compute the leading error term to obtain information concerning the major effects of both dissipation and dispersion.

We will proceed by first deriving the modified equation for the previous two methods applied to the full 2-D Navier-Stokes equations. The Jacobians which appear in the modified equations will then be developed and FORTRAN code written through use of the symbolic manipulation language "MACSYMA" (copyright, Symbolics, Inc.). The error terms will then be coded into two representative computer codes. A typical problem will then be solved and the error terms compared with the magnitude of the turbulent shear stress. Conclusions will then be drawn based on the results.

The next section covers the description of the Navier-Stokes equations. The following two sections cover the description and mechanics of deriving the modified equation for two numerical schemes used to solve the Navier-Stokes equation. The two schemes are the MacCormack explicit scheme and the Beam-Warming implicit scheme. The derivation of the flux Jacobians and the generation of the FORTRAN code is given in Section V. The physical problem to be analyzed, as well as the results, discussion and conclusions are given in the final four sections. The detailed flux Jacobians and the FORTRAN code to generate them are given in the three appendices.

II. Navier-Stokes Equations

The set of governing equations to be analyzed is the 2-D unsteady Navier-Stokes equations on a fixed mesh.

The transformation to be applied to the governing equations is given as:

$$\begin{aligned}\tau &= \tau(t) \\ \xi &= \xi(x, y) \\ n &= n(x, y)\end{aligned}$$

The time transformation is stated in the unusual form $\tau = \tau(t)$ so that the effect of changes in time step on the error structure may be addressed.

If Cartesian velocity components are retained as dependent variables, the two-dimensional, unsteady Navier-Stokes equations can be transformed to the arbitrary curvilinear space ξ, η, τ in strong conservation law form. The transformed equations can be written in nondimensional form as

$$\partial_{\tau} \hat{q} + \partial_{\xi} (\hat{E} - \hat{E}_v) + \partial_{\eta} (\hat{F} - \hat{F}_v) = 0$$

where

$$\hat{q} = J^{-1} \begin{bmatrix} \rho \\ \rho u \\ \rho v \\ e \end{bmatrix} \quad \hat{E} = J^{-1} t_{\tau} \begin{bmatrix} \rho U \\ \rho u U + \xi_x p \\ \rho v U + \xi_y p \\ (e + p) U - \xi_t p \end{bmatrix}$$

$$\hat{F} = J^{-1} t_{\tau} \begin{pmatrix} \rho V \\ \rho u V + \eta_x p \\ \rho v V + \eta_y p \\ (e + p)V - \eta_t p \end{pmatrix}$$

and

$$U = \xi_t + \xi_x u + \xi_y v$$

$$V = \eta_t + \eta_x u + \eta_y v$$

where U and V are contravariant velocities written without metric normalization.

The viscous flux terms are given by

$$\hat{E}_V = J^{-1} t_{\tau} \begin{pmatrix} \xi_x \tau_{xx} + \xi_y \tau_{xy} \\ \xi_x \tau_{yx} + \xi_y \tau_{yy} \\ \xi_x \beta_x + \xi_y \beta_y \end{pmatrix}$$

$$\hat{F}_V = J^{-1} t_{\tau} \begin{pmatrix} \eta_x \tau_{xx} + \eta_y \tau_{xy} \\ \eta_x \tau_{yx} + \eta_y \tau_{yy} \\ \eta_x \beta_x + \eta_y \beta_y \end{pmatrix}$$

and

$$\tau_{xx} = \lambda(u_x + v_y) + 2\mu u_x = \frac{2}{3} \mu(2u_x - v_y)$$

$$\tau_{xy} = \tau_{yx} = \mu(u_y + v_x)$$

$$\tau_{yy} = \lambda(u_x + v_y) + 2\mu v_y = \frac{2}{3} \mu(2v_y - u_x)$$

$$\beta_x = \gamma\mu Pr^{-1} \partial_x e_I + u\tau_{xx} + v\tau_{xy}$$

$$\beta_y = \gamma\mu Pr^{-1} \partial_y e_I + u\tau_{yx} + v\tau_{yy}$$

$$e_I = e\rho^{-1} - 0.5(u^2 + v^2) = \frac{1}{\gamma-1} \frac{p}{\rho}$$

Here it is understood that the Cartesian derivatives are to be expanded in ξ, η space via chain-rule relations such as

$$u_x = \xi_x u_\xi + \eta_x u_\eta$$

The Cartesian velocity components u, v , are nondimensionalized with respect to a_∞ (the freestream speed of sound), density ρ is referenced to ρ_∞ ; and total energy e to $\rho_\infty a_\infty^2$. Pressure is defined as

$$p = (\gamma-1)[e - 0.5\rho(u^2 + v^2)]$$

and throughout γ is the ratio of specific heats. Also, κ is the coefficient of thermal conductivity, μ is the dynamic viscosity, while λ from the Stokes' hypothesis is $-2/3 \mu$. The Reynolds number is Re and the Prandtl number is Pr .

Finally, the metric terms are obtained from the chain-rule expansion of x_ξ, y_ξ , etc., and solved for ξ_x, ξ_y , etc., to give

$$\xi_x = J y_\eta$$

$$\eta_x = -J y_\xi$$

$$\xi_y = J x_\eta$$

$$\eta_y = J x_\xi$$

and

$$J^{-1} = x_{\xi} y_{\eta} - x_{\eta} y_{\xi}$$

In this report, we analyze two schemes. The first is the MacCormack explicit predictor-corrector scheme and the second is the Beam-Warming implicit scheme.

III. MacCormack's Scheme

The scheme is written in a special form to facilitate the modified equation analysis as applied to the equation

$$w_\tau + f_\xi + g_\eta = 0$$

The predictor step is

$$\begin{aligned} \overline{w_{ij}^{n+1}} = & w_{ij}^n - \sigma^\xi (1 - \beta^\xi)(f_{i+1}^n - f_i^n) - \sigma^\xi \beta^\xi (f_i^n - f_{i-1}^n) \\ & - \sigma^\eta (1 - \beta^\eta)(g_{j+1}^n - g_j^n) - \sigma^\eta \beta^\eta (g_j^n - g_{j-1}^n) \end{aligned}$$

and the corrector step is

$$\begin{aligned} w^{n+1} = & w^n - \frac{\sigma^\xi}{2} \{ \beta^\xi [(f_{i+1}^{\overline{n+1}} - f_{i+1}^n) - (f_i^{\overline{n+1}} - f_i^n)] \\ & + (1 - \beta^\xi) [(f_i^{\overline{n+1}} - f_i^n) - (f_{i-1}^{\overline{n+1}} - f_{i-1}^n)] \\ & + (f_{i+1}^n - f_{i-1}^n) \} \\ & - \frac{\sigma^\eta}{2} \{ \beta^\eta [(g_{j+1}^{\overline{n+1}} - g_{j+1}^n) - (g_j^{\overline{n+1}} - g_j^n)] \\ & + (1 - \beta^\eta) [(g_j^{\overline{n+1}} - g_j^n) - (g_{j-1}^{\overline{n+1}} - g_{j-1}^n)] + (g_{j+1}^n - g_{j-1}^n) \} \end{aligned}$$

where

$$\sigma^\xi = \Delta\tau/\Delta\xi$$

$$\sigma^\eta = \Delta\tau/\Delta\eta$$

and β^ξ, β^η are the parameters of MacCormack's scheme.

The functional dependencies for the Navier-Stokes equations are given by the transformed equation as

$$w_\tau + t_\tau(f_\xi + g_\eta) = 0$$

where f is a function of w , w_ξ , and w_η , and similarly for g . Thus we have

$$f = f(w, w_\xi, w_\eta)$$

and

$$g = g(w, w_\xi, w_\eta)$$

For the moment we do not consider the specific form of differencing the viscous terms.

Defining

$$u = w_\xi \text{ and } v = w_\eta$$

obtains

$$f = f(w, u, v)$$

$$g = g(w, u, v)$$

From MacCormack's scheme, given in the special form, we need to expand terms like

$$(\overline{f^{n+1}} - f^n), \text{ etc.,; call } \overline{f^{n+1}} = \tilde{f}$$

Now the Taylor Series expansion in three variables up to second order is

$$\tilde{f} - f^n = f^w(\tilde{w}-w) + f^u(\tilde{w}-w)_\xi + f^v(\tilde{w}-w)_\eta$$

$$\begin{aligned}
& + \frac{1}{2} f^{ww} (\tilde{w}-w)^2 + \frac{1}{2} f^{wu} (\tilde{w}-w) (\tilde{w}-w)_\xi + \frac{1}{2} f^{wv} (\tilde{w}-w) (\tilde{w}-w)_\eta \\
& + \frac{1}{2} f^{uw} (\tilde{w}-w)_\xi (\tilde{w}-w) + \frac{1}{2} f^{uu} [(\tilde{w}-w)_\xi]^2 + \frac{1}{2} f^{uv} (\tilde{w}-w)_\xi (\tilde{w}-w)_\eta \\
& + \frac{1}{2} f^{vw} (\tilde{w}-w)_\eta (\tilde{w}-w) + \frac{1}{2} f^{vu} (\tilde{w}-w)_\eta (\tilde{w}-w)_\xi + \frac{1}{2} f^{vv} [(\tilde{w}-w)_\eta]^2
\end{aligned}$$

where

$$f^w = \frac{\partial f}{\partial w} ; \quad f^u = \frac{\partial f}{\partial u} = \frac{\partial f}{\partial w_\xi} ;$$

$$f^v = \frac{\partial f}{\partial v} = \frac{\partial f}{\partial w_\eta} ;$$

and

$$f^{uv} = \frac{\partial^2 f}{\partial w_\xi \partial w_\eta} ; \text{ etc.}$$

A similar expression is obtained for

$$\begin{aligned}
\tilde{g} - g &= g^w (\tilde{w}-w) + g^u (\tilde{w}-w)_\xi + g^v (\tilde{w}-w)_\eta \\
& + \frac{1}{2} g^{ww} (\tilde{w}-w)^2 + \frac{1}{2} g^{wu} (\tilde{w}-w) (\tilde{w}-w)_\xi + \frac{1}{2} g^{wv} (\tilde{w}-w) (\tilde{w}-w)_\eta
\end{aligned}$$

$$\begin{aligned}
& + \frac{1}{2} g^{uw} (\tilde{w}-w)_{\xi} (\tilde{w}-w) + \frac{1}{2} g^{uu} [(\tilde{w}-w)_{\xi}]^2 + \frac{1}{2} g^{uv} (\tilde{w}-w)_{\xi} (\tilde{w}-w)_{\eta} \\
& + \frac{1}{2} g^{vw} (\tilde{w}-w)_{\eta} (\tilde{w}-w) + \frac{1}{2} g^{vu} (\tilde{w}-w)_{\eta} (\tilde{w}-w)_{\xi} + \frac{1}{2} g^{vv} [(\tilde{w}-w)_{\eta}]^2
\end{aligned}$$

We also have

$$\begin{aligned}
(\tilde{w}-w) &= -\Delta\tau t_{\tau} (f_{\xi} + g_{\eta}) - \frac{\Delta\tau \Delta\xi}{2} (1-2\beta^{\xi}) t_{\tau} f_{2\xi} \\
&\quad - \frac{\Delta\tau \Delta\eta}{2} (1-2\beta^{\eta}) t_{\tau} g_{2\eta} \\
&= -t_{\tau} (\Delta\xi a + \Delta\eta b + \frac{\Delta\xi^2}{2} (1-2\beta^{\xi}) a_{\xi} + \frac{\Delta\eta^2}{2} (1-2\beta^{\eta}) b_{\eta})
\end{aligned}$$

where

$$a = \sigma^{\xi} f_{\xi}$$

and

$$b = \sigma^{\eta} g_{\eta}$$

A better definition would be

$$(\tilde{w}-w) = -t_{\tau} \{ \Delta\tau c + \frac{\Delta\xi^2}{2} (1-2\beta^{\xi}) a_{\xi} + \frac{\Delta\eta^2}{2} (1-2\beta^{\eta}) b_{\eta} \}$$

where

$$c = (f_{\xi} + g_{\eta})$$

$$(\tilde{w}-w)^2 = t_\tau^2 \Delta \tau^2 c^2 + O(\Delta^3)$$

$$(\tilde{w}-w)_\xi (\tilde{w}-w)_\eta = t_\tau^2 \Delta \tau c_\xi c_\eta + O(\Delta^3)$$

Thus

$$\tilde{f} - f^n = -\Delta \tau t_\tau \{f^w c + f^u c_\xi + f^v c_\eta\}$$

$$-t_\tau \frac{\Delta \xi^2}{2} (1 - 2\beta^\xi) \{f^w a_\xi + f^u a_{\xi\xi} + f^v a_{\xi\eta}\}$$

$$-t_\tau \frac{\Delta \eta^2}{2} (1 - 2\beta^\eta) \{f^w b_\eta + f^u b_{\eta\xi} + f^v b_{\eta\eta}\}$$

$$+ \frac{\Delta \tau^2}{2} t_\tau^2 [f^{ww}(c^2) + f^{wu} c c_\xi + f^{wv} c c_\eta$$

$$+ f^{uw} c_\xi c + f^{uu} (c_\xi)^2 + f^{uv} c_\xi c_\eta$$

$$+ f^{vw} c_\eta c + f^{vu} c_\eta c_\xi + f^{vv} (c_\eta)^2] + O(\Delta^3)$$

Similarly

$$\begin{aligned}
\tilde{g} - g^n &= - \Delta \tau t_\tau \{ g^w c + g^u c_\xi + g^v c_\eta \} \\
&- \Delta \xi^2 \frac{t_\tau}{2} (1-2\beta^\xi) \{ g^w a_\xi + g^u a_{\xi\xi} + g^v a_{\xi\eta} \} \\
&- \Delta \eta^2 \frac{t_\tau}{2} (1-2\beta^\eta) \{ g^w b_\eta + g^u b_{\eta\xi} + g^v b_{\eta\eta} \} \\
&+ \Delta \tau^2 \frac{t_\tau^2}{2} [g^{ww} c^2 + g^{wu} c c_\xi + g^{wv} c c_\eta \\
&\quad g^{uw} c_\xi c + g^{uu} (c_\xi^2) + g^{uv} c_\xi c_\eta \\
&\quad + g^{vw} c_\eta c + g^{vu} c_\eta c_\xi + g^{vv} c_\eta^2] + o(\Delta^3)
\end{aligned}$$

The modified equation is now

$$w_\tau + t_\tau (f_\xi + g_\eta) = - \frac{\Delta \tau}{2} w_{2\tau} - \frac{\Delta \tau^2}{6} w_{3\tau} - \frac{\Delta \xi^2}{6} t_\tau f_{3\xi} - \frac{\Delta \eta^2}{6} t_\tau g_{3\eta}$$

$$- \frac{t_\tau}{2} \{ (\tilde{f} - f^n)_\xi + (\tilde{g} - g^n)_\eta \}$$

$$+ \frac{t_\tau}{4} \{ \Delta\xi (1-2\beta^\xi) (\tilde{f}-f^n)_{2\xi} + \Delta\eta (1-2\beta^\eta) (\tilde{g}-g^n)_{2\eta} \} + o(\Delta^3)$$

Substituting for $(\tilde{f}-f^n)$ and $(\tilde{g}-g^n)$

$$w_\tau + t_\tau (f_\xi + g_\eta) = - \frac{\Delta\tau}{2} w_{2\tau}$$

$$+ \frac{\Delta\tau}{2} t_\tau^2 \{ f^w_c + f^u_c{}_\xi + f^v_c{}_\eta \}_\xi$$

$$+ \frac{\Delta\tau}{2} t_\tau^2 \{ g^w_c + g^u_c{}_\xi + g^v_c{}_\eta \}_\eta + \text{S.O.T.}$$

where

$$\text{S.O.T.} = \frac{\Delta\tau^2}{6} w_{3\tau} - \frac{\Delta\xi^2}{6} t_\tau f_{3\xi} - \frac{\Delta\eta^2}{6} t_\tau g_{3\eta}$$

$$- \frac{\Delta\tau t_\tau^2}{4} [(1-2\beta^\xi) \Delta\xi \{ f^w_c + f^u_c{}_\xi + f^v_c{}_\eta \}_{2\xi}$$

$$+ (1-2\beta^\eta) \Delta\eta \{ g^w_c + g^u_c{}_\xi + g^v_c{}_\eta \}_{2\eta}]$$

$$+ \Delta \xi^2 \frac{t_\tau^2}{4} (1-2\beta^\xi) [\{f^w a_\xi + f^u a_{\xi\xi} + f^v a_{\xi\eta}\}_\xi + \{g^w a_\xi + g^u a_{\xi\xi} + g^v a_{\xi\eta}\}_\eta]$$

$$+ \Delta \eta^2 \frac{t_\tau^2}{4} (1-2\beta^\eta) [\{f^w b_\eta + f^u b_{\eta\xi} + f^v b_{\eta\xi}\}_\xi + \{g^w b_\eta + g^u b_{\eta\xi} + g^v b_{\eta\eta}\}_\eta]$$

$$- \frac{\Delta \tau^2 t_\tau^3}{4} [\{f^{ww} c^2 + f^{wu} c c_\xi + f^{wv} c c_\eta\}_\xi + \{g^{ww} c^2 + g^{wu} c c_\xi + g^{wv} c c_\eta\}_\eta]$$

$$+ \{f^{uw} c_\xi c + f^{uu} c_\xi^2 + f^{uv} c_\xi c_\eta\}_\xi + \{g^{uw} c_\xi c + g^{uu} c_\xi^2 + g^{uv} c_\xi c_\eta\}_\eta$$

$$+ \{f^{vw} c_\eta c + f^{vu} c_\eta c_\xi + f^{vv} c_\eta^2\}_\xi + \{g^{vw} c_\eta c + g^{vu} c_\eta c_\xi + g^{vv} c_\eta^2\}_\eta]$$

This equation can be rewritten as

$$w_\tau = - t_\tau c - \frac{\Delta \tau}{2} w_{2\tau} + \frac{\Delta \tau}{2} t_\tau^2 [c] + \text{s.o.t.} + o(\Delta^3)$$

with the operator [] defined as

$$[a] \equiv \{f^w a + f^u a_\xi + f^v a_\eta\}_\xi + \{g^w a + g^u a_\xi + g^v a_\eta\}_\eta$$

and

$$- \frac{\Delta\tau}{2} w_{2\tau} = + \frac{\Delta\tau}{2} t_{\tau\tau} c + \frac{\Delta\tau}{2} t_{\tau} c_{\tau} + \frac{\Delta\tau^2}{4} w_{3\tau} - \frac{\Delta\tau^2}{2} t_{\tau} t_{\tau\tau} [c]$$

$$- \frac{\Delta\tau^2}{4} t_{\tau}^2 [c]_{\tau}$$

The modified equation becomes

$$w_{\tau} = - t_{\tau} c + \frac{\Delta\tau}{2} t_{\tau\tau} c + \frac{\Delta\tau}{2} t_{\tau} c_{\tau} + \frac{\Delta\tau^2}{4} w_{3\tau} - \frac{\Delta\tau^2}{2} t_{\tau} t_{\tau\tau} [c]$$

$$- \frac{\Delta\tau^2}{4} t_{\tau}^2 [c]_{\tau} + \frac{\Delta\tau}{2} t_{\tau}^2 [c] + \text{S.O.T.} + o(\Delta^3)$$

$$= - t_{\tau} c + \frac{\Delta\tau}{2} t_{\tau\tau} c + \frac{\Delta\tau}{2} t_{\tau} c_{\tau} + \frac{\Delta\tau}{2} t_{\tau}^2 [c] + (\text{S.O.T.})_2 + \\ + \text{S.O.T.} + o(\Delta^3)$$

where

$$c \equiv f_{\xi} + g_{\eta} \text{ and } (\text{S.O.T.})_2 = \frac{\Delta\tau^2}{4} w_{3\tau} - \frac{\Delta\tau^2}{2} t_{\tau} t_{\tau\tau} [c] - \frac{\Delta\tau^2}{4} t_{\tau}^2 [c]_{\tau}$$

$$\text{Solve for } c_\tau = f_{\xi\tau} + g_{\eta\tau} = \{f_\tau\}_\xi + \{g_\tau\}_\eta$$

$$= \{f^w_\tau + f^u_\tau \xi + f^v_\tau \eta\}_\xi + \{g^w_\tau + g^u_\tau \xi + g^v_\tau \eta\}_\eta$$

$$= [w_\tau]$$

therefore, substituting for w_τ in the operator

$$\frac{\Delta\tau}{2} t_\tau c_\tau = \frac{\Delta\tau}{2} t_\tau \{[-t_\tau c + \frac{\Delta\tau}{2} t_{\tau\tau} c + \frac{\Delta\tau}{2} t_\tau c_\tau + \frac{\Delta\tau}{2} t_\tau^2 [c]]\}$$

$$= -\frac{\Delta\tau}{2} t_\tau^2 [c] + \frac{\Delta\tau^2}{4} t_\tau t_{\tau\tau} [c]$$

thus, since the second term will be of higher order

$$c_\tau = -t_\tau [c]$$

and

$$w_\tau = -t_\tau c + \frac{\Delta\tau}{2} t_{\tau\tau} c + \frac{\Delta\tau^2}{4} t_\tau t_{\tau\tau} [c]$$

$$+ (\text{S.O.T.})_2 + (\text{S.O.T.}) + O(\Delta^3)$$

$$= -t_{\tau}c + \frac{\Delta\tau}{2} t_{\tau\tau}c + \frac{\Delta\tau^2}{4} t_{\tau}t_{\tau\tau}[c]$$

$$+ \frac{\Delta\tau^2}{4} w_{3\tau} - \frac{\Delta\tau^2}{2} t_{\tau}t_{\tau\tau}[c] - \frac{\Delta\tau^2}{4} t_{\tau}^2 [c]_{\tau} + \text{S.O.T.}$$

Now

$$w_{\tau} = -t_{\tau}c$$

$$w_{2\tau} = -t_{\tau\tau}c - t_{\tau}c_{\tau}$$

$$= -t_{\tau\tau}c + t_{\tau}^2 [c]$$

$$w_{3\tau} = -t_{\tau\tau\tau}c - t_{\tau\tau}c_{\tau} + 2t_{\tau}t_{\tau\tau}[c] + t_{\tau}^2 [c]_{\tau}$$

$$= -t_{\tau\tau\tau}c + t_{\tau}t_{\tau\tau}[c] + 2t_{\tau}t_{\tau\tau}[c] + t_{\tau}^2 [c]_{\tau}$$

$$\frac{\Delta\tau^2}{4} w_{3\tau} = -\frac{\Delta\tau^2}{4} t_{\tau\tau\tau}c + 3\frac{\Delta\tau^2}{4} t_{\tau}t_{\tau\tau}[c] + \frac{\Delta\tau^2}{4} t_{\tau}^2 [c]_{\tau}$$

$$w_{\tau} = - t_{\tau}^c + \frac{\Delta\tau}{2} t_{\tau\tau}^c + \frac{\Delta\tau^2}{4} t_{\tau} t_{\tau\tau}[c]$$

$$- \frac{\Delta\tau^2}{4} t_{\tau\tau\tau}^c + \frac{3}{4} \Delta\tau^2 t_{\tau} t_{\tau\tau}[c]$$

$$- \frac{\Delta\tau^2}{2} t_{\tau} t_{\tau\tau}[c] + \text{S.O.T.} + o(\Delta^3)$$

$$w_{\tau} + t_{\tau} (f_{\xi} + g_{\eta}) = \frac{\Delta\tau}{2} t_{\tau\tau}^c - \frac{\Delta\tau^2}{4} t_{\tau\tau\tau}^c$$

$$+ \frac{\Delta\tau^2}{2} t_{\tau} t_{\tau\tau\tau}[c] + \text{S.O.T.} + o(\Delta^3)$$

where S.O.T. are as previously defined. Since in the S.O.T. we have

$$- \frac{\Delta\tau^2}{6} w_{3\tau} = + \frac{\Delta\tau^2}{6} t_{\tau\tau\tau}^c - \frac{3\Delta\tau^2}{6} t_{\tau} t_{\tau\tau}[c] - \frac{\Delta\tau^2}{6} t_{\tau}^2[c]_{\tau}$$

and

$$[c] = \{f^w_c + f^u_c_{\xi} + f^v_c_{\eta}\}_{\xi} + \{g^w_c + g^u_c_{\xi} + g^v_c_{\eta}\}_{\eta}$$

we obtain

$$[c]_{\tau} = -t_{\tau} \overline{\overline{[c]}} + [c_{\tau}]$$

where the operator $\overline{\overline{[a]}}$ is defined as

$$\begin{aligned} \overline{\overline{[a]}} = & \left\{ f^{ww} a^2 + f^{wu} aa_{\xi} + f^{wv} aa_{\eta} \right. \\ & + f^{uw} a_{\xi} a + f^{uu} a_{\xi}^2 + f^{uv} a_{\xi} a_{\eta} \\ & + f^{vw} a_{\eta} a + f^{vu} a_{\eta} a_{\xi} + f^{vv} a_{\eta}^2 \left. \right\}_{\xi} \\ & + \left\{ g^{ww} a^2 + g^{wu} aa_{\xi} + g^{wv} aa_{\eta} \right. \\ & + g^{uw} a_{\eta} a + g^{uu} a_{\xi}^2 + g^{uv} a_{\xi} a_{\eta} \\ & + g^{vw} a_{\xi} a + g^{vu} a_{\eta} a_{\xi} + g^{vv} a_{\eta}^2 \left. \right\}_{\eta} \end{aligned}$$

Now

$$[c_{\tau}] = -t_{\tau} [[c]]$$

thus

$$[c]_{\tau} = -t_{\tau} \{ \overline{\overline{[c]}} + [[c]] \}$$

and the modified equation becomes

$$\begin{aligned}
w_{\tau} + t_{\tau} (f_{\xi} + g_{\eta}) &= \frac{\Delta\tau}{2} t_{\tau\tau} c - \frac{\Delta\tau^2}{12} t_{\tau\tau\tau} c \\
&- \frac{\Delta\tau^2}{6} t_{\tau}^3 \left\{ \frac{1}{2} \bar{[c]} - [[c]] \right\} - \frac{\Delta\xi^2}{6} t_{\tau} f_{3\xi} - \frac{\Delta\eta^2}{6} t_{\tau} g_{3\eta} \\
&+ \frac{\Delta\xi^2}{4} t_{\tau}^2 (1-2\beta^{\xi}) [a_{\xi}] + \frac{\Delta\eta^2}{4} t_{\tau}^2 (1-2\beta^{\eta}) [b_{\eta}] \\
&- \Delta\tau \frac{t_{\tau}^2}{4} \{ \Delta\xi (1-2\beta^{\xi}) (f^w_c + f^u_{c\xi} + f^v_{c\eta})_{2\xi} \\
&\quad + \Delta\eta (1-2\beta^{\eta}) (g^w_c + g^u_{c\xi} + g^v_{c\eta})_{2\eta} \}
\end{aligned}$$

where

$$a_{\xi} = \sigma^{\xi} f_{2\xi}$$

$$b_{\eta} = \sigma^{\eta} g_{2\eta}$$

The Jacobian matrices needed for the modified equation given on the previous page are derived in Section V.

IV. Beam-Warming Implicit Scheme

If the Cartesian velocity components are retained as dependent variables, the Navier-Stokes equations in two dimensions can be written in a general curvilinear coordinate system ξ and η , in conservation law form (see Ref. 1) as:

$$w_{\tau} + t_{\tau}(E - E_{v1} - E_{v2})_{\xi} + t_{\tau}(F - F_{v1} - F_{v2})_{\eta} = 0,$$

where

$$w = J^{-1}[\rho, \rho u, \rho v, e]^T,$$

$(E - E_{v1} - E_{v2})$ and $(F - F_{v1} - F_{v2})$ are the flux vectors, $t = t(\tau)$ is a time transformation and the subscript notation has been used for the derivatives. As customary, ρ is the density, u and v are the Cartesian velocity components in the Cartesian directions x and y and e is the total energy. In addition J is given by:

$$J = (x_{\xi}y_{\eta} - x_{\eta}y_{\xi})^{-1},$$

where

$$x = x(\xi, \eta)$$

$$y = y(\xi, \eta)$$

In the above form ρ , u , v and e are nondimensionalized respectively by ρ_{∞} , a_{∞} , a_{∞} and $\rho_{\infty} a_{\infty}^2$.

We also have:

$$E = J^{-1} \begin{array}{c} \rho U \\ \rho u U + \xi_x p \\ \rho v U + \xi_y p \\ (e + \rho) u \end{array}, \quad F = J^{-1} \begin{array}{c} \rho V \\ \rho u V + \eta_x p \\ \rho v V + \eta_y p \\ (e + \rho) v \end{array}$$

$$Ev_1 + Ev_2 = J^{-1} \begin{array}{c} 0 \\ \xi_x \tau_{xx} + \xi_y \tau_{xy} \\ \xi_x \tau_{yx} + \xi_y \tau_{yy} \\ \xi_x \beta_x + \xi_y \beta_y \end{array}$$

$$Fv_1 + Fv_2 = J^{-1} \begin{array}{c} 0 \\ \eta_x \tau_{xx} + \eta_y \tau_{xy} \\ \eta_x \tau_{yx} + \eta_y \tau_{yy} \\ \eta_x \beta_x + \eta_y \beta_y \end{array}$$

where

$$U = \xi_x u + \xi_y v$$

$$V = \eta_x u + \eta_y v$$

$$p = (\gamma-1) \left[e - \frac{1}{2} \rho (u^2 + v^2) \right]$$

$$\tau_{xx} = \frac{2}{3} \mu (2u_x - v_y)$$

$$\tau_{xy} = \tau_{yx} = \mu (u_y + v_x)$$

$$\tau_{yy} = \frac{2}{3} \mu (2v_y - u_x)$$

$$\beta_x = \frac{\gamma\mu}{Pr} \frac{\partial e_I}{\partial x} + u \tau_{xx} + v \tau_{xy}$$

$$\beta_y = \frac{\gamma\mu}{Pr} \frac{\partial e_I}{\partial y} + u \tau_{yx} + v \tau_{yy}$$

$$e_I = e/\rho - \frac{1}{2} (u^2 + v^2) = \frac{1}{\gamma-1} \frac{p}{\rho}$$

$$\xi_x = Jy_\eta, \quad \eta_x = -Jy_\xi$$

$$\xi_y = Jx_\eta, \quad \eta_y = Jx_\xi,$$

and

$$f_x = Jy_\eta f_\xi - Jy_\xi f_\eta$$

$$f_y = -Jx_\eta f_\xi + Jx_\xi f_\eta$$

for any function f .

In the above, p is the pressure, μ is the coefficient of viscosity, γ is the ratio of specific heats, Pr is the Prandtl number and e_I is the internal energy. Note also that the Stokes' hypothesis of zero bulk viscosity has been used.

While $E = E(w)$ and $F = F(w)$, the viscous flux vectors, $E_{v1} + E_{v2}$ and $F_{v1} + F_{v2}$ are split such that

$$E_{v1} = E_{v1}(w, w_\xi)$$

$$E_{v2} = E_{v2}(w, w_\eta)$$

and

$$F_{v1} = F_{v1}(w, w_{\xi})$$

$$F_{v2} = F_{v1}(w, w_{\eta})$$

In the Beam and Warming Scheme (see Ref. 2) the dependent variable w is advanced in time using

$$\Delta^n w = \frac{\theta_1 \Delta \tau}{1 + \theta_2} \Delta^n w_{\tau} + \frac{\Delta \tau}{1 + \theta_2} w_{\tau}^n + \frac{\theta_2}{1 + \theta_2} \Delta^{n-1} w$$

where $\Delta^n f = f^{n+1} - f^n$ for a function of time τ . The parameters θ_1 and θ_2 can be chosen in various ways to reduce the scheme to many standard difference formulas. In general the scheme is first-order accurate in time, and if $\theta_1 - \theta_2 - 1/2 = 0$ it is second-order accurate.

U Inserting the Navier-Stokes equations in the scheme and noting that $\Delta^n(fg) = f^n \Delta^n g + g^n \Delta^n f + O(\Delta \tau^2)$ for any two functions of time f and g we get

$$\begin{aligned} \Delta^n w = & \frac{\theta_1 \Delta \tau}{1 + \theta_2} [t_{\tau}^n (-\Delta^n E + \Delta^n E_{\mu 1} + \Delta^n E_{v 2})_{\xi}] \\ & + t_{\tau}^n (-\Delta^n F + \Delta^n F_{v 1} + \Delta^n F_{v 2})_{\eta} \end{aligned}$$

$$+ \frac{\theta_1 \Delta \tau}{1+\theta_2} \Delta^n t_\tau [(-E + E_{v1} + E_{v2})_\xi + (-F + F_{v1} + F_{v2})_\eta]^n$$

$$+ \frac{\Delta \tau}{1+\theta_2} t_\tau [(-E + E_{v1} + E_{v2})_\xi + t_\tau (-F + F_{v1} + F_{v2})_\eta]^n$$

$$+ \frac{\theta_2}{1+\theta_2} \Delta^{n-1} w$$

Now

$$\Delta^n E = A^n \Delta^n w + o(\Delta \tau^2)$$

$$\Delta^n F = B^n \Delta^n w + o(\Delta \tau^2)$$

where A and B are the Jacobians

$$A = \frac{\partial E}{\partial w}$$

$$B = \frac{\partial F}{\partial w}$$

Also

$$\Delta^n E_{v1} = P^n \Delta^n w + R^n \Delta^n w_\xi + O(\Delta \tau^2)$$

$$\Delta^n F_{v2} = Q^n \Delta^n w + S^n \Delta^n w_\eta + O(\Delta \tau^2)$$

where

$$P = \frac{\partial E_{v1}}{\partial w}, \quad Q = \frac{\partial F_{v2}}{\partial w},$$

$$R = \frac{\partial E_{v1}}{\partial w_\xi}, \quad S = \frac{\partial F_{v2}}{\partial w_\eta}$$

therefore

$$\Delta^n E_{v1} = P^n \Delta^n w - R_\xi^n \Delta^n w + (R^n \Delta^n w)_\xi$$

$$\Delta^n F_{v2} = Q^n \Delta^n w - S_\eta^n \Delta^n w + (S^n \Delta^n w)_\eta$$

In order to maintain the block tridiagonal form of the final equations, the cross-derivative terms are evaluated explicitly, without loss of accuracy, by noting that

$$\Delta^n E_{v2} = \Delta^{n-1} E_{v2} + O(\Delta\tau^2)$$

$$\Delta^n F_{v1} = \Delta^{n-1} F_{v1} + O(\Delta\tau^2)$$

Upon substitution

$$\Delta^n w = \frac{\theta_1 \Delta\tau^n}{1+\theta_2} \{ [-A^n \Delta^n w + P^n \Delta^n w - R_\xi^n \Delta^n w + (R^n \Delta^n w)_\xi + \Delta^{n-1} E_{v2}] \}$$

$$+ [-B^n \Delta^n w + Q^n \Delta^n w - S_\eta^n \Delta^n w + (S^n \Delta^n w)_\eta + \Delta^{n-1} F_{v1}]_\eta \}$$

$$+ \frac{\theta_1 \Delta\tau}{1+\theta_2} \Delta^n t_\tau [(-E + E_{v1} + E_{v2})_\xi + (-F + F_{v1} + F_{v2})_\eta]^n$$

$$\frac{\Delta\tau^n}{1+\theta_2} [(-E + E_{v1} + E_{v2})_\xi + (-F + F_{v1} + F_{v2})_\eta]^n$$

$$+ \frac{\theta_2}{1+\theta_2} \Delta^{n-1} w$$

factoring and using the central difference operators for the space derivatives

$$\{I + \frac{\theta_1 \Delta \tau t^n}{1+\theta_2} [\delta_\xi (A - P + R_\xi)^n - \delta_{\xi\xi} R^n]\} \cdot$$

$$\{I + \frac{\theta_1 \Delta \tau t^n}{1+\theta_2} [\delta_\eta (B - Q + S_\eta)^n - \delta_{\eta\eta} S^n]\} \Delta^n w =$$

$$+ \frac{\theta_1 \Delta \tau}{1+\theta_2} \Delta^n t_\tau [\delta_\xi (-E + E_{v1} + E_{v2})^n + \delta_\eta (-F + F_{v1} + F_{v2})^n]$$

$$+ \frac{\Delta \tau t^n}{1+\theta_2} [\delta_\xi (-E + E_{v1} + E_{v2})^n + \delta_\eta (-F + F_{v1} + F_{v2})^n]$$

$$+ \frac{\theta_1 \Delta \tau t^n}{1+\theta_2} [\delta_\xi \Delta^{n-1} E_{v2} + \delta_\eta \Delta^{n-1} F_{v1}]$$

$$+ \frac{\theta_2}{1+\theta_2} \Delta^{n-1} w$$

Now let

$$\alpha = \frac{\theta_1 \Delta \tau}{1+\theta_2}$$

$$\beta = \frac{\Delta \tau}{1+\theta_2}$$

$$\bar{\gamma} = \frac{\theta_2}{1+\theta_2}$$

and add implicit second-difference and explicit fourth-difference dissipation

$$\{I + \alpha t_\tau^n [\delta_\xi (A - P + R_\xi)^n - \delta_{\xi\xi} R^n] + D_\xi\} \cdot$$

$$\{I + \alpha t_\tau^n [\delta_\eta (B - Q + S_\eta)^n - \delta_{\eta\eta} S^n] + D_\eta\} \Delta^n w =$$

$$+ \alpha \Delta^n t_\tau [\delta_\xi (-E + E_{v1} + E_{v2})^n + \delta_\eta (-F + F_{v1} + F_{v2})^n]$$

$$+ \beta t_\tau^n [\delta_\xi (-E + E_{v1} + E_{v2})^n + \delta_\eta (-F + F_{v1} + F_{v2})^n] + D$$

$$+ \alpha t_\tau^n [\delta_\xi \Delta^{n-1} E_{v2} + \delta_\eta \Delta^{n-1} F_{v1}]$$

$$+ \bar{\gamma} \Delta^{n-1} w$$

where

$$D_\xi = - \bar{\epsilon}_{i1} J^{-1} \nabla_\xi \Delta_\xi J$$

$$D_\eta = - \bar{\epsilon}_{i2} J^{-1} \nabla_\eta \Delta_\eta J$$

$$D = - \bar{\epsilon}_e J^{-1} [(\nabla_\xi \Delta_\xi)^2 + (\nabla_\eta \Delta_\eta)^2] J w^n$$

and Δ and ∇ are the usual forward and backwards difference operators.

Since it is often the case that the thin-layer approximation is used in Navier-Stokes calculations and since solid boundaries may be present in a problem along either the ξ or η coordinates, we introduce the parameter a and b in order to tag differently the viscous terms involving the ξ and η -derivatives (a and b take the values 0 or 1 only):

$$\{I + \alpha t_{\tau}^n [\delta_{\xi}(A - aP + a R_{\xi})^n - a\delta_{\xi\xi}R^n] + D_{\xi}\} \cdot$$

$$\{I + \alpha t_{\tau}^n [\delta_{\eta}(B - bQ + b S_{\eta})^n - b\delta_{\eta\eta}S^n] + D_{\eta}\} \Delta^n w =$$

$$\alpha \Delta^n t_{\tau} [\delta_{\xi}(-E + aE_{v1} + abE_{v2})^n + \delta_{\eta}(-F + abF_{v1} + bF_{v2})^n]$$

$$\beta t_{\tau}^n [\delta_{\xi}(-E + aE_{v1} + abE_{v2})^n + \delta_{\eta}(-F + abF_{v1} + bF_{v2})^n] + D$$

$$+ \alpha t_{\tau}^n ab [\delta_{\xi} (\Delta^{n-1} E_{v2})_{\eta} + \delta_{\eta} (\Delta^{n-1} F_{v1})]$$

$$+ \bar{\gamma} \Delta^{n-1} w$$

If we now let

$$L = A - aP + aR_{\xi}$$

$$M = B - bQ + bS_{\eta}$$

and

$$X = -E + aE_{v1} + abE_{v2}$$

$$Y = -F + abF_{v1} + bF_{v2}$$

we obtain finally

$$\{I + \alpha t_{\tau}^n [\delta_{\xi} L^n - a \delta_{\xi \xi} R^n] + D_{\xi}\} \cdot \{I + \alpha t_{\tau}^n [\delta_{\eta} M^n - b \delta_{\eta \eta} S^n] + D_{\eta}\} \Delta \bar{w} =$$

$$\alpha \Delta^n t_{\tau} [\delta_{\xi} X^n + \delta_{\eta} Y^n] + \beta t_{\tau}^n [\delta_{\xi} X^n + \delta_{\eta} Y^n] + D$$

$$+ \alpha t_{\tau}^n ab [\delta_{\xi} \Delta^{n-1} E_{v2} + \delta_{\eta} \Delta^{n-1} F_{v1}] + \bar{\gamma} \Delta^{n-1} w$$

In general the first step in deriving the modified differential equation is to expand each term in the difference scheme in a Taylor Series about the point (ξ, η, τ) , collect terms

of the same order and then retain the equation to the order desired. In the present case this would necessitate Taylor series expansions in three independent variables, to some reasonably high order, before it can become possible to identify the terms that are needed. Here, we will proceed differently by deciding at the outset the order to which we want the modified equation to be accurate and then write down only the terms that are needed, using single variable Taylor series expansions, to reach that order of accuracy.

For example, we wish the modified equation to be accurate to third order. Since after all terms have been expanded, it is necessary to divide everywhere by $\Delta\tau$ to recover the Navier-Stokes terms on the left-hand side of the equation, every term in the above difference formula should be expanded to fourth order. Before proceeding to do that, we first note that for any function $f(x)$ of the single variable x we have the following:

$$\delta_x f = f_x + \frac{1}{6} \Delta x^2 f_{3x} + O(\Delta x^4)$$

$$\delta_{xx} f = f_{xx} + \frac{1}{12} \Delta x^2 f_{4x} + O(\Delta x^4)$$

$$\nabla_x \Delta_x f = \Delta x^2 f_{xx} + O(\Delta x^4)$$

$$(\nabla_x \Delta_x)^2 f = \Delta x^4 f_{4x} + O(\Delta x^6)$$

Remembering that α and $\Delta^n w$ are both of the order of $\Delta\tau$ we expand as follows:

$$\Delta^n w = w_\tau \Delta\tau + \frac{1}{2} w_{\tau\tau} \Delta\tau^2 + \frac{1}{6} w_{3\tau} \Delta\tau^3 + \frac{1}{24} w_{4\tau} \Delta\tau^4$$

$$\delta_\xi L \Delta^n w = (L \Delta^n w)_\xi + \frac{1}{6} \Delta\xi^2 (L \Delta^n w)_{3\xi}$$

$$\delta_{\xi\xi} R \Delta^n w = (R \Delta^n w)_{\xi\xi} + \frac{1}{12} \Delta\xi^2 (R \Delta^n w)_{4\xi}$$

$$D_\xi D^n w = -\bar{\epsilon}_{i1} J^{-1} \Delta\xi^2 (J \Delta^n w)_{\xi\xi}$$

Similarly

$$\delta_\eta M \Delta^n w = (M \Delta^n w)_\eta + \frac{1}{6} \Delta\eta^2 (M \Delta^n w)_{3\eta}$$

$$\delta_{\eta\eta} S \Delta^n w = (S \Delta^n w)_{\eta\eta} + \frac{1}{12} \Delta\eta^2 (S \Delta^n w)_{4\eta}$$

$$D_\eta \Delta^n w = -\bar{\epsilon}_{i2} J^{-1} \Delta\eta^2 (J \Delta^n w)_{\eta\eta}$$

Now

$$\delta_{\xi}^L \delta_{\eta}^M \Delta^N w = L_{\xi} (M \Delta^N w)_{\eta} + (M \Delta^N w)_{\xi \eta}$$

$$\delta_{\xi}^L \delta_{\eta \eta} S \Delta^N w = L_{\xi} (S \Delta^N w)_{\eta \eta} + L (S \Delta^N w)_{\xi \eta \eta}$$

$$\delta_{\xi}^L D_{\eta} \Delta^N w = -\overline{\epsilon_{i2}} [L J^{-1} (J \Delta^N w)_{\eta \eta}]_{\xi} \Delta \eta^2$$

$$\delta_{\xi \xi}^R \delta_{\eta}^M \Delta^N w = R_{\xi \xi} (M \Delta^N w)_{\eta} + 2 R_{\xi} (M \Delta^N w)_{\xi \eta} + R (M \Delta^N w)_{\xi \xi \eta}$$

$$\delta_{\xi \xi}^R \delta_{\eta \eta} S \Delta^N w = R_{\xi \xi} (S \Delta^N w)_{\eta \eta} + 2 R_{\xi} (S \Delta^N w)_{\xi \eta \eta} + R (S \Delta^N w)_{\xi \xi \eta \eta}$$

$$\delta_{\xi \xi}^R D_{\eta} \Delta^N w = -\overline{\epsilon_{i2}} \{R [J^{-1} (J \Delta^N w)_{\eta \eta}]\}_{\xi \xi} \Delta \eta^2$$

$$D_{\xi} \delta_{\eta}^M \Delta^N w = -\overline{\epsilon_{i1}} J^{-1} \Delta \xi^2 [J (M \Delta^N w)_{\eta}]_{\xi \xi}$$

$$D_{\xi} \delta_{\eta \eta} S \Delta^N w = -\overline{\epsilon_{i1}} J^{-1} \Delta \xi^2 [J (S \Delta^N w)_{\eta \eta}]_{\xi \xi}$$

$$D_{\xi} D_{\eta} \Delta^n w = O(\Delta \xi^2 \Delta \eta^2 \Delta \tau)$$

Having done that, $\Delta^n w$ is now expanded only to the order needed to bring all terms to the 4th order. By repeating the above procedure for the terms on the right-hand side of the difference formula, dividing everywhere by $\Delta \tau$, denoting $\alpha/\Delta \tau$ by $\bar{\alpha}$ and $\beta/\Delta \tau$ by $\bar{\beta}$ and noting that $1-\bar{\gamma} = \bar{\beta}$ we get

$$\bar{\beta}[w_{\tau} - t_{\tau}(X_{\xi} + Y_{\eta})] =$$

$$-\Delta \tau \frac{\bar{\gamma}+1}{2} w_{\tau\tau} + \bar{\alpha} t_{\tau}(Lw_{\tau})_{\xi} - \bar{\alpha} \alpha t_{\tau}(Rw_{\tau})_{\xi\xi} + \bar{\alpha} t_{\tau}(Mw_{\tau})_{\eta}$$

$$- \bar{\alpha} b t_{\tau}(Sw_{\tau})_{\eta\eta} - \bar{\alpha} t_{\tau\tau}(X_{\xi} + Y_{\eta}) - \bar{\alpha} a b t_{\tau}[(E_{v2})_{\tau\xi} + (F_{v1})_{\tau\eta}] \}$$

$$-\Delta \tau^2 \left\{ \frac{\bar{\beta}}{6} w_{3\tau} + \frac{\bar{\alpha}}{2} t_{\tau}(Lw_{\tau\tau})_{\xi} - \frac{\bar{\alpha}a}{2} t_{\tau}(Rw_{\tau\tau})_{\xi\xi} + \frac{\bar{\alpha}}{2} t_{\tau}(Mw_{\tau\tau})_{\eta} \right.$$

$$- \frac{\bar{\alpha}b}{2} t_{\tau}(Sw_{\tau\tau})_{\eta\eta} + \bar{\alpha}^2 t_{\tau}^2 L_{\xi}(Mw_{\tau})_{\eta} + \bar{\alpha}^2 t_{\tau}^2 L(Mw_{\tau})_{\xi\eta}$$

$$\left. - \bar{\alpha}^2 b t_{\tau}^2 L_{\xi}(Sw_{\tau})_{\eta\eta} - \bar{\alpha}^2 b t_{\tau}^2 L(Sw_{\tau})_{\xi\eta\eta} \right\}$$

$$-\bar{a}^2 \text{at}_{\tau}^2 \text{R}_{\xi\xi}(\text{Mw}_{\tau})_{\eta} - 2\bar{a}^2 \text{at}_{\tau}^2 \text{R}_{\xi}(\text{Mw}_{\tau})_{\xi\eta}$$

$$-\bar{a}^2 \text{at}_{\tau}^2 \text{R}(\text{Mw}_{\tau})_{\xi\xi\eta}$$

$$+ \bar{a}^2 \text{abt}_{\tau}^2 \text{R}_{\xi\xi}(\text{Sw}_{\tau})_{\eta\eta} + 2\bar{a}^2 \text{abt}_{\tau}^2 \text{R}_{\xi}(\text{Sw}_{\tau})_{\xi\eta\eta}$$

$$+\bar{a}^2 \text{abt}_{\tau}^2 \text{R}(\text{Sw}_{\tau})_{\xi\xi\eta\eta}$$

$$+ \frac{\bar{a}ab}{2} t_{\tau}[(E_{v2})_{\tau\tau\xi} + (F_{v1})_{\tau\tau\eta}] - \frac{\bar{a}}{2} t_{3\tau}(X_{\xi} + Y_{\eta})\}$$

$$+ J^{-1} \{ \bar{\epsilon}_{i1} \Delta \xi^2 (Jw_{\tau})_{\xi\xi} + \bar{\epsilon}_{i2} \Delta \eta^2 (Jw_{\tau})_{\eta\eta} \}$$

$$+ \frac{\bar{\beta}}{6} t_{\tau}(\Delta \xi^2 X_{3\xi} + \Delta \eta^2 Y_{3\eta})$$

$$-\Delta \tau^3 \{ \frac{1+\bar{\gamma}}{24} w_{4\tau} + \frac{\bar{a}}{6} t_{\tau}(Lw_{3\tau})_{\xi} - \frac{\bar{a}}{6} a t_{\tau}(Rw_{3\tau})_{\xi\xi} + \frac{\bar{a}}{6} t_{\tau}(Mw_{3\tau})_{\eta}$$

$$- \frac{\bar{a}}{6} b t_{\tau} (Sw_{3\tau}) \eta \eta + \frac{\bar{a}^2}{2} t_{\tau}^2 L_{\xi} (Mw_{\tau\tau}) \eta + \frac{\bar{a}^2}{2} t_{\tau}^2 L (Mw_{\tau\tau}) \xi \eta$$

$$- \frac{\bar{a}^2}{2} b t_{\tau}^2 L_{\xi} (Sw_{\tau\tau}) \eta \eta - \frac{\bar{a}^2}{2} b t_{\tau}^2 L (Sw_{\tau\tau}) \xi \eta \eta$$

$$- \frac{\bar{a}^2}{2} a t_{\tau}^2 R_{\xi\xi} (Mw_{\tau\tau}) \eta - \bar{a}^2 a t_{\tau}^2 R_{\xi} (Mw_{\tau\tau}) \xi \eta$$

$$- \frac{\bar{a}^2}{2} a t_{\tau}^2 R (Mw_{\tau\tau}) \xi \xi \eta + \frac{\bar{a}^2}{2} ab t_{\tau}^2 R_{\xi\xi} (Sw_{\tau\tau}) \eta \eta$$

$$+ \bar{a}^2 ab t_{\tau}^2 R_{\xi} (Sw_{\tau\tau}) \xi \eta + \frac{\bar{a}^2}{2} ab t_{\tau}^2 R (Sw_{\tau\tau}) \xi \xi \eta \eta$$

$$- \frac{\bar{a}^2}{6} ab t_{\tau} [(E_{v2})_{3\tau\xi} + (F_{v1})_{3\tau\eta}] - \frac{\bar{a}}{6} t_{4\tau} (X_{\xi} - Y_{\eta}) \}$$

$$+ \frac{\bar{a}}{6} \Delta\tau \Delta\xi^2 [t_{\tau\tau} X_{3\xi} + ab t_{\tau} (E_{v2})_{3\xi\tau} - t_{\tau} (Lw_{\tau})_{3\xi}$$

$$+ \frac{a}{2} t_{\tau} (Rw_{\tau})_{4\xi}]$$

$$+ \frac{\bar{a}}{6} \Delta\tau \Delta\eta^2 [t_{\tau\tau}^Y{}_{3\eta} + abt_{\tau} (F_{v1})_{3\eta\tau} - t_{\tau} (Mw_{\tau})_{\xi\eta}]$$

$$+ \frac{b}{2} t_{\tau} (Sw_{\tau})_{4\eta}]$$

$$+ J^{-1} \frac{\Delta\tau}{2} \overline{\epsilon}_{i1} \Delta\xi^2 (Jw_{\tau\tau})_{\xi\xi} + \overline{\epsilon}_{i2} \Delta\eta^2 (Jw_{\tau\tau})_{\eta\eta}\}$$

$$+ \bar{\alpha} \overline{\epsilon}_{i2} t_{\tau} \Delta\tau \Delta\eta^2 [L J^{-1} (Jw_{\tau})_{\eta\eta}]_{\xi}$$

$$- \bar{\alpha} a \overline{\epsilon}_{i2} t_{\tau} \Delta t \Delta\eta^2 [R J^{-1} (Jw_{\tau})_{\eta\eta}]_{\xi\xi}$$

$$+ \bar{\alpha} \overline{\epsilon}_{i1} t_{\tau} J^{-1} \Delta t \Delta\xi^2 [J (Mw_{\tau})_{\eta}]_{\xi\xi}$$

$$- \bar{\alpha} b \overline{\epsilon}_{i1} t_{\tau} J^{-1} \Delta\tau \Delta\xi^2 [J (Sw_{\tau})_{\eta\eta}]_{\xi\xi}$$

$$- \bar{\epsilon}_e J^{-1} \left[\frac{\Delta \xi^4}{\Delta \tau} (Jw)_{4\xi} + \frac{\Delta \eta^4}{\Delta \tau} (Jw)_{4\eta} \right]$$

The left-hand side of the above equation is, except for the factor $\bar{\beta}$, the Navier-Stokes term, modified by the coefficients a and b introduced earlier. The right-hand side is the truncation error, up to third order. To make the equation amenable to analysis, all terms on the right-hand side must first be expanded in terms of the derivatives of w and then all terms containing w_τ must be eliminated by repeated application of the modified equation itself (see Ref. 3). Before attempting to do that, we write the equation to second order in a somewhat more expanded form:

$$\bar{\beta} [w_\tau - t_\tau (X_\xi + Y_\eta)] =$$

$$- \Delta \tau \left\{ \frac{\gamma+1}{2} w_{\tau\tau} + \bar{a} t_\tau (L_\xi w_\tau + L w_{\tau\xi}) - \bar{a} a t_\tau (R_{\xi\xi} w_\tau + 2R_{\xi\tau} w_{\tau\xi} \right.$$

$$+ R w_{\tau\xi\xi}) + \bar{a} t_\tau (M_\eta w_\tau + M w_{\tau\eta}) - \bar{a} b t_\tau (S_{\eta\eta} w_\tau + 2S_{\eta\tau} w_{\tau\eta}$$

$$+ S w_{\tau\eta\eta}) - \bar{a} t_{\tau\tau} (X_\xi + Y_\eta) - \bar{a} a b t_\tau [(E_{v2})_{\tau\xi} + (F_{v1})_{\tau\eta}] \}$$

$$\begin{aligned}
& - \Delta \tau^2 \left\{ \frac{\bar{\theta}}{6} w_{3\tau} + \frac{\bar{a}}{2} t_{\tau} (L_{\xi} w_{\tau\tau} + L w_{\tau\tau\xi}) - \frac{\bar{a}a}{2} t_{\tau} (R_{\xi\xi} w_{\tau\tau} + 2R_{\xi} w_{\tau\tau\xi} + R w_{\tau\tau\xi\xi}) \right. \\
& + \frac{\bar{a}}{2} t_{\tau} (M_{\eta} w_{\tau\tau} + M w_{\tau\tau\eta}) - \frac{\bar{a}b}{2} t_{\tau} (S_{\eta\eta} w_{\tau\tau} + 2S_{\eta} w_{\tau\tau\eta} + S w_{\tau\tau\eta\eta}) \\
& + \bar{a}^2 t_{\tau}^2 L_{\xi} (M_{\eta} w_{\tau} + M w_{\tau\eta}) + \bar{a}^2 t_{\tau}^2 L (M_{\xi\eta} w_{\tau} + M_{\xi} w_{\tau\eta} + M_{\eta} w_{\tau\xi} + M w_{\tau\xi\eta}) \\
& - \bar{a}^2 b t_{\tau}^2 L_{\xi} (S_{\eta\eta} w_{\tau} + 2S_{\eta} w_{\tau\eta} + S w_{\tau\eta\eta}) - \bar{a}^2 b t_{\tau}^2 L (S_{\xi\eta\eta} w_{\tau} + S_{\eta\eta} w_{\tau\xi} \\
& + 2S_{\eta\xi} w_{\tau\eta} + 2S_{\eta} w_{\tau\eta\xi} + S_{\xi} w_{\tau\eta\eta} + S w_{\tau\eta\eta\xi}) \\
& - \bar{a}^2 a t_{\tau}^2 R_{\xi\xi} (M_{\eta} w_{\tau} + M w_{\tau\eta}) - 2 \bar{a}^2 a t_{\tau}^2 R_{\xi} (M_{\xi\eta} w_{\tau} + M_{\xi} w_{\tau\eta} + M_{\eta} w_{\tau\xi} + M w_{\tau\xi\eta}) \\
& - \bar{a}^2 a t_{\tau}^2 R (M_{\xi\xi\eta} w_{\tau} + M_{\xi\xi} w_{\tau\eta} + 2M_{\xi\eta} w_{\tau\xi} + 2M_{\xi} w_{\tau\eta\xi} + M_{\eta} w_{\tau\xi\xi} + M w_{\tau\xi\xi\eta}) \\
& + \bar{a}^2 a b t_{\tau}^2 R_{\xi\xi} (S_{\eta\eta} w_{\tau} + 2S_{\eta} w_{\tau\eta} + S w_{\tau\eta\eta}) + 2 \bar{a}^2 a b t_{\tau}^2 R_{\xi} (S_{\eta\eta\xi} w_{\tau} + S_{\eta\eta} w_{\tau\xi} \\
& + 2S_{\eta\xi} w_{\tau\eta} + 2S_{\eta} w_{\tau\eta\xi} + S_{\xi} w_{\tau\eta\eta} + S w_{\tau\eta\eta\xi})
\end{aligned}$$

$$\begin{aligned}
& + \bar{\alpha}^2 abt^2 R (S_{\xi\xi\eta\eta} w_\tau + 2S_{\xi\xi\eta} w_{\tau\eta} + S_{\xi\xi} w_{\tau\eta\eta} + 2S_{\xi\eta\eta} w_{\tau\xi} + 4S_{\xi\eta} w_{\tau\eta\xi} + 2S_{\eta\eta} w_{\tau\eta\xi} \\
& \quad + S_{\eta\eta} w_{\tau\xi\xi} + 2S_{\eta} w_{\tau\xi\xi\eta} + S w_{\tau\xi\xi\eta\eta}) \\
& \quad + \frac{\bar{\alpha}ab}{2} t_\tau [(E_{v2})_{\tau\tau\xi} + (F_{v1})_{\tau\tau\eta}] - \frac{\bar{\alpha}}{2} t_{3\tau} (X_\xi + Y_\eta) \} \\
& + J^{-1} \{ \bar{\epsilon}_{i1} \Delta\xi^2 (J_{\xi\xi} w_\tau + 2J_{\xi} w_{\tau\xi} + J w_{\tau\xi\xi}) + \bar{\epsilon}_{i2} \Delta\eta^2 (J_{\eta\eta} w_\tau + 2J_{\eta} w_{\tau\eta} + J w_{\tau\eta\eta}) \} \\
& + \frac{\bar{\rho}}{6} t_\tau (\Delta\xi^2 X_{3\xi} + \Delta\eta^2 Y_{3\eta})
\end{aligned}$$

Now, recall that the viscous flux vectors contain the coefficient of viscosity μ and the Prandtl number Pr . If a turbulence model such as the Baldwin-Lomax model (Ref. 4) is to be used in the computations, μ would be replaced by $\mu + \mu_t$ and Pr by $Pr + Pr_t$, where μ_t is an eddy viscosity coefficient and Pr_t is a constant. μ_t can be assumed in general to be a function of w , w_ξ , and w_η . On the other hand, the molecular viscosity coefficient μ is a function of temperature and, therefore, is a function of w . In the Beam and Warming scheme μ and μ_t are assumed to be locally independent of w and its derivatives and are functions of ξ and η only. This amounts to evaluating $\mu + \mu_t$, on the implicit side of the scheme, at the previous time step n . However, for the purpose of deriving the modified equation the functional dependence of $\mu + \mu_t$ on w , w_ξ and w_η must be used. With this in mind and after letting

$$L = \bar{L} + aR_{\xi}; \quad \bar{L} = A - aP$$

$$M = \bar{M} + bS_{\eta}; \quad \bar{M} = B - bQ$$

we have

$$\bar{L} = \bar{L}(w, w_{\xi}; \mu; \xi, \eta)$$

$$\bar{M} = \bar{M}(w, w_{\eta}; \mu; \xi, \eta)$$

$$R = R(w, w_{\xi}; \mu; \xi, \eta)$$

$$S = S(w, w_{\eta}; \mu; \xi, \eta)$$

$$X = X(w, w_{\xi}; w_{\eta}; \mu; \xi, \eta)$$

$$Y = Y(w, w_{\xi}; w_{\eta}; \mu; \xi, \eta)$$

$$E_{v2} = E_{v2}(w, w_{\xi}; \mu; \xi, \eta)$$

$$F_{v1} = F_{v1}(w, w_{\xi}; \mu; \xi, \eta)$$

$$\mu = \mu(w, w_{\xi}; w_{\eta}; \xi, \eta)$$

To extract the derivatives of w out of the various derivative terms on the right-hand side of the equation, these terms must be expressed in terms of the Jacobians of the original flux vectors with respect to w , w_{ξ} , and w_{η} and their derivatives with respect to μ , as well as in terms of the Jacobians of μ with respect to w , w_{ξ} , and w_{η} . In addition, the elimination of the τ -derivatives from the equation will require the evaluation of a

number of other derivative-terms not appearing in the equation in its present form. Terms such as $S_{\xi\xi\eta\eta}$, $X_{\xi\xi\xi\eta\eta}$, $Y_{\xi\xi\eta\eta\eta}$, $\mu_{\xi\xi\eta\eta}$ and the corresponding lower order derivatives are required, for instance. A simple calculation shows that terms such as $X_{\xi\xi\xi\eta\eta}$ is the sum of at least 2500 terms. It is not difficult to see, therefore, that carrying out all the expansions needed by hand and doing the necessary algebra to obtain the modified equation in its final form is impractical to say the least. A computer must be used. In fact, the computer could be provided with relatively compact formulae to carry out all the expansions needed. In order to see how this could be done, assume that f is a function $f(w_0, w_1, w_2, w_3; \xi_1, \xi_2)$ where w_0, w_1, w_2 , and w_3 are functions of ξ_1, ξ_2 and let f_{ijklm} denote $\frac{\partial^5 f}{\partial \xi_i \partial \xi_j \partial \xi_k \partial \xi_l \partial \xi_m}$,

where i, j, k, l , and m take the values 1 and 2 only, and w_{pqrst} denote the derivatives of w with respect to $\xi_p, \xi_q, \xi_r, \xi_s$ and ξ_t , where p, q, r, s and t take the values 0, 1, 2 and 3. We set $w_0 \equiv w$, $w_1 \equiv w_\xi$, $w_2 \equiv w_\eta$, $w_3 \equiv \mu$, $\xi_1 \equiv \xi$ and $\xi_2 \equiv \eta$, and take the convention that a derivative with respect to ξ_0 means no derivative at all and a derivative with respect to ξ_3 mean that w is really μ ; example: w_{01221} means $w_{\xi \xi_2 \xi_2 \xi_1}$, and w_{32212} means

$\mu_{\xi_2 \xi_2 \xi_1 \xi_2}$. Furthermore, we reserve the notation f^i for the derivative of f with respect to the variable ξ_i appearing explicitly in the expression of f . With this we can write:

$$f_i = \sum_{p=0}^3 f_w w_{pi} + f^i$$

$$f_{ij} = \sum_{p=0}^3 \sum_{q=0}^3 f_w w_{pq} w_{qj} w_{pi} + f_w^j w_{pi} + f_w w_{pij} + f_w^i w_{qj} + f^{ij}$$

$$f_{ijk} = \sum_{p=0}^3 \sum_{q=0}^3 \sum_{r=0}^3 f_w w_{pq} w_r w_{rk} w_{qj} w_{pi} + f_w^k w_{pq} w_{qj} w_{pi}$$

$$+ f_{w_p w_q} w_{qj} w_{pik} + f_{w_p w_q} w_{qjk} w_{pi} + f_{w_p w_r}^i w_{rk} w_{pi} + f_{w_p}^{jk} w_{pi}$$

$$+ f_{w_p}^i w_{pik} + f_{w_p w_r} w_{rk} w_{pij} + f_{w_p}^k w_{pij} + f_{w_p} w_{pijk}$$

$$+ f_{w_q w_r}^i w_{rk} w_{qj} + f_{w_q}^{jk} w_{qj} + f_{w_q}^i w_{qjk} + f_{w_r}^{ij} w_{rk} + f_{ij}^{jk}$$

$$f_{ijkl} = \sum_{p=0}^3 \sum_{q=0}^3 \sum_{r=0}^3 \sum_{s=0}^3 (f_{w_p w_q w_r w_s} w_{sl} + f_{w_p w_q w_r}^l) w_{rk} w_{qj} w_{pi}$$

$$+ f_{w_p w_q w_r} w_{rkl} w_{qj} w_{pi} + f_{w_p w_q w_r} w_{rk} w_{qjl} w_{pi}$$

$$+ f_{w_p w_q w_r} w_{rk} w_{qj} w_{pil} + (f_{w_p w_q w_s}^k w_{sl} + f_{w_p w_q}^{kl}) w_{qj} w_{pi}$$

$$+ f_{w_p w_q}^k w_{qjl} w_{pi} + f_{w_p w_q}^k w_{qj} w_{pil} + (f_{w_p w_q w_s} w_{sl} + f_{w_p w_q}^l) \cdot$$

$$w_{qj} w_{pik} + f_{w_p w_q} w_{qjl} w_{pik} + f_{w_p w_q} w_{qj} w_{pikl}$$

$$+ (f_{w_p w_q w_s} w_{sl} + f_{w_p w_q}^l) w_{qjk} w_{pi} + f_{w_p w_q} w_{qjkl} w_{pi} + f_{w_p w_q} w_{qjk} w_{pil}$$

$$+ (f_{w_p w_r}^j w_{sl} + f_{w_p w_r}^{jl}) w_{rk} w_{pi} + f_{w_p w_r}^j w_{rkl} w_{pi}$$

$$+ f_{w_p w_r}^j w_{rk} w_{pil} + (f_{w_p w_s}^{jk} w_{sl} + f_{w_p}^{jkl}) w_{pi} + f_{w_p}^{jk} w_{pil}$$

$$+ (f_{w_p w_s}^j w_{sl} + f_{w_p}^{jl}) w_{pik} + f_{w_p}^j w_{pikl} + (f_{w_p w_r} w_{sl} + f_{w_p w_r}^l) w_{rk} w_{pij}$$

$$+ f_{w_p w_r} w_{rkl} w_{pij} + f_{w_p w_r} w_{rk} w_{pijl} + (f_{w_p w_s}^k w_{sl} + f_{w_p}^{kl}) w_{pij}$$

$$\begin{aligned}
& + f_{w_p}^k w_{pijl} + (f_{w_p w_s} w_{sl} + f_{w_p}^l) w_{pijk} + f_{w_p} w_{pijkl} \\
& + (f_{w_p w_r w_s}^i w_{sl} + f_{w_q w_r}^{il}) w_{rk} w_{qj} + f_{w_q w_r}^i w_{rk} w_{qj} + f_{w_q w_r}^i w_{rk} w_{qjl} \\
& + (f_{w_q w_s}^{ik} w_{sl} + f_{w_q}^{ikl}) w_{qj} + f_{w_q}^{ik} w_{qjl} + (f_{w_q w_s}^i w_{sl} + f_{w_q}^i) w_{qjk} \\
& + f_{w_q}^i w_{qikl} + (f_{w_r w_s}^{ij} w_{sl} + f_{w_r}^{ijl}) w_{rk} + f_{w_r}^{ij} w_{rk} l \\
& + f_{w_s}^{ijk} w_{sl} + f_{w_s}^{ijkl} .
\end{aligned}$$

f_{ijklm} can equally be written down using f_{ijkl} .

Note that the above formulae apply to the quantities X and Y which are functions of w , w_ξ , w_η , μ , ξ and η . For quantities such as \bar{L} , R , F_{v1} , which are functions of w , w_ξ , μ , ξ and η only, and \bar{M} , S , E_{v2} , which are functions of w , w_η , μ , ξ and η , the above formulae must still be used in their general form in order to maintain their consistency. However, an instruction can be added to delete terms containing Jacobians with respect to w_η in the first case and w_ξ in the second. When $f \equiv \mu$ it is sufficient to stop the summations over p, q, r, s and t at 2, i.e. sum from 0 to 2. If a τ -derivative is involved, that is if one index in f_{ijklm} corresponds to a time derivative, the formulae still apply except that all terms with f_{ijklm} containing that index should be cancelled. With this all necessary expansions can be handled using the same formulae above.

Note that despite the fact that the summation signs $\sum_{p=0}^3 \sum_{q=0}^3$

$\sum_{r=0}^3 \sum_{s=0}^3$ appear to cover all terms on the right-hand side, not all of these terms contain all four indices and therefore those that do not can be taken out of the loop.

Note also that since every time a derivative is taken terms that are products of a number of terms become products of an even larger number of terms, the previous estimate of the number of terms involved in one term on the right-hand side of the modified equation is an underestimate. The correct number of terms involved can be found by examining, for instance, the expression of f_{ijkl} .

Finally, consider a term such as:

$$f_{pqr} w_s w_{sl} w_{rk} w_{qj} w_{pi}$$

for one combination of p, q, r, s, i, j, k , and l . Since f is a vector (it may be a 4x4 Jacobian) and w is a vector, this term alone is a sum of 4^5 or 1024 terms. If f is already a 4x4 Jacobian the count is 4096.

With such estimates it becomes quickly clear that even on a computer some difficulties may arise, particularly in terms of storage requirements and the logistics of carrying out algebraic operations on huge numbers of terms. Some additional thought must be given to ways of circumventing these types of difficulties.

Perhaps it will become necessary to consider the way the modified equation is to be analyzed simultaneously with ways of obtaining it.

V. Flux Jacobian Matrices

The flux terms are

$$f = f(w, w_\xi, w_\eta)$$

$$g = g(w, w_\xi, w_\eta)$$

where

$$w = \left[\frac{\rho}{J}, \frac{\rho u}{J}, \frac{\rho v}{J}, \frac{e}{J}, x, y \right]^T; J^{-1} = x_\xi y_\eta - x_\eta y_\xi$$

$$f = f_c + f_v \text{ and } g = g_c + g_v$$

$$f_c = J^{-1} \begin{pmatrix} \rho U \\ \rho u U + \xi_x p \\ \rho v U + \xi_y p \\ (e + p) U \\ 0 \\ 0 \end{pmatrix} = J^{-1} \begin{pmatrix} \rho(\xi_x u + \xi_y u) \\ \rho u (\xi_x u + \xi_y v) + \xi_x p \\ \rho v (\xi_x u + \xi_y v) + \xi_y p \\ (e + p)(\xi_x u + \xi_y v) \\ 0 \\ 0 \end{pmatrix}$$

$$f_v = J^{-1} \begin{pmatrix} 0 \\ \xi_x \tau_{xx} + \xi_y \tau_{xy} \\ \xi_x \tau_{yx} + \xi_y \tau_{yy} \\ \xi_x \beta_x + \xi_y \beta_y \\ 0 \\ 0 \end{pmatrix} = J^{-1} \begin{pmatrix} 0 \\ \xi_x \tau_{xx} + \xi_y \tau_{xy} \\ \xi_x \tau_{yx} + \xi_y \tau_{yy} \\ \xi_x \left(\frac{\gamma \mu}{(\gamma-1) P_r} \left(\frac{p}{\rho} \right)_x + u \tau_{xx} + v \tau_{xy} \right) \\ + \xi_y \left(\frac{\gamma \mu}{(\gamma-1) P_r} \left(\frac{p}{\rho} \right)_y + u \tau_{yx} + v \tau_{yy} \right) \\ 0 \\ 0 \end{pmatrix}$$

$$g_c = J^{-1} \begin{pmatrix} 0 \\ \rho v \\ \rho u v + \eta_x p \\ \rho v v + \eta_y p \\ (e + p) v \\ 0 \\ 0 \end{pmatrix} = J^{-1} \begin{pmatrix} \rho(\eta_x u + \eta_y^0 v) \\ \rho u(\eta_x u + \eta_y v) + \eta_x p \\ \rho v(\eta_x u + \eta_y v) + \eta_y p \\ (e + p)(\eta_x u + \eta_y v) \\ 0 \\ 0 \end{pmatrix}$$

$$g_v = J^{-1} \begin{pmatrix} 0 \\ \eta_x \tau_{xx} + \eta_y \tau_{xy} \\ \eta_x \tau_{yx} + \eta_y \tau_{yy} \end{pmatrix} = J^{-1} \begin{pmatrix} 0 \\ \eta_x \tau_{xx} + \eta_y \tau_{xy} \\ \eta_x \tau_{yx} + \eta_y \tau_{yy} \end{pmatrix}$$

$$\begin{matrix} \eta_x \beta_x + \eta_y \beta_y \\ 0 \\ 0 \end{matrix}$$

$$\begin{aligned} & \left\{ \eta_x \left(\frac{\gamma \mu}{(\gamma-1) \text{Pr}} \left(\frac{p}{\rho} \right)_x + u \tau_{xx} + v \tau_{xy} \right) \right. \\ & \left. + \eta_y \left(\frac{\gamma \mu}{(\gamma-1) \text{Pr}} \left(\frac{p}{\rho} \right)_y + u \tau_{yx} + v \tau_{yy} \right) \right\} \\ & \begin{matrix} 0 \\ 0 \end{matrix} \end{aligned}$$

Note that we have added two extra equations to the N-S, equation, i.e.

$$x_\tau = 0 \text{ and } y_\tau = 0$$

so that we have a consistent way of including the spatial derivatives of the metrics in the computation of the flux Jacobians. Since we are considering stationary meshes only, this addition does not increase the complexity of the system.

The components of the conserved variable vector are

$$w_1 = \frac{\rho}{J} = \hat{\rho}$$

$$w_2 = \frac{\rho u}{J} = \frac{m}{J} = \hat{m}$$

$$w_3 = \frac{\rho v}{J} = \frac{n}{J} = \hat{n}$$

$$w_4 = \frac{e}{J} = \hat{e}$$

$$w_5 = x$$

$$w_6 = y$$

we also have $u = \frac{\hat{m}}{\hat{\rho}}; v = \frac{\hat{n}}{\hat{\rho}}$

$$\frac{p}{J} = (\gamma-1) \left[\hat{e} - \frac{1}{2} \frac{\hat{m}^2}{\hat{\rho}} - \frac{1}{2} \frac{\hat{n}^2}{\hat{\rho}} \right]$$

$$\frac{p}{\rho} = (\gamma-1) \frac{1}{\hat{\rho}} \left[\hat{e} - \frac{1}{2} \frac{\hat{m}^2}{\hat{\rho}} - \frac{1}{2} \frac{\hat{n}^2}{\hat{\rho}} \right]$$

$$\frac{(e + p)}{J} = \gamma \hat{e} - \frac{\gamma-1}{2} \left(\frac{\hat{m}^2}{\hat{\rho}} + \frac{\hat{n}^2}{\hat{\rho}} \right)$$

and other repeatedly used terms

$$(\)_x = y_\eta^J (\)_\xi - y_\xi^J (\)_\eta$$

$$(\)_y = -x_\eta^J (\)_\xi + x_\xi^J (\)_\eta$$

$$\tau_{xx} = \frac{2}{3} \mu [2y_\eta^J (\frac{\hat{m}}{\hat{\lambda}})_\xi - 2y_\xi^J (\frac{\hat{m}}{\hat{\lambda}})_\eta + x_\eta^J (\frac{\hat{n}}{\hat{\lambda}})_\xi - x_\xi^J (\frac{\hat{n}}{\hat{\lambda}})_\eta]$$

$$\tau_{xy} = \mu [-x_\eta^J (\frac{\hat{m}}{\hat{\lambda}})_\xi + x_\xi^J (\frac{\hat{m}}{\hat{\lambda}})_\eta + y_\eta^J (\frac{\hat{n}}{\hat{\lambda}})_\xi - y_\xi^J (\frac{\hat{n}}{\hat{\lambda}})_\eta]$$

$$\tau_{yy} = \frac{2}{3} \mu [-2x_\eta^J (\frac{\hat{n}}{\hat{\lambda}})_\xi + 2x_\xi^J (\frac{\hat{n}}{\hat{\lambda}})_\eta - y_\eta^J (\frac{\hat{m}}{\hat{\lambda}})_\xi + y_\xi^J (\frac{\hat{m}}{\hat{\lambda}})_\eta]$$

where

$$J^{-1} = x_\xi^J y_\eta - x_\eta^J y_\xi$$

$$\left(\frac{\hat{m}}{\hat{\rho}}\right)_{\xi} = \frac{\hat{m}}{\hat{\rho}} \xi - \frac{\hat{m}}{\hat{\rho}^2} \hat{\rho}_{\xi}; \quad \left(\frac{\hat{m}}{\hat{\rho}}\right)_{\eta} = \frac{\hat{m}}{\hat{\rho}} \eta - \frac{\hat{m}}{\hat{\rho}^2} \hat{\rho}_{\eta}$$

$$\left(\frac{\hat{n}}{\hat{\rho}}\right)_{\xi} = \frac{\hat{n}}{\hat{\rho}} \xi - \frac{\hat{n}}{\hat{\rho}^2} \hat{\rho}_{\xi}; \quad \left(\frac{\hat{n}}{\hat{\rho}}\right)_{\eta} = \frac{\hat{n}}{\hat{\rho}} \eta - \frac{\hat{n}}{\hat{\rho}^2} \hat{\rho}_{\eta}$$

The components of the ξ -flux vector are

$$f_1 = \frac{\rho u \xi_x}{J} + \frac{\rho v \xi_y}{J}$$

$$f_2 = \frac{\rho u^2 \xi_x}{J} + \frac{\rho u v \xi_y}{J} + p \frac{\xi_x}{J} + \frac{\tau_{xx}}{J} \xi_x + \frac{\tau_{xy}}{J} \xi_y$$

$$f_3 = \frac{\rho u v \xi_x}{J} + \frac{\rho v^2 \xi_y}{J} + p \frac{\xi_y}{J} + \frac{\tau_{xy} \xi_x}{J} + \tau_{yy} \frac{\xi_y}{J}$$

$$f_4 = (e + p) \frac{(\xi_x u + \xi_y v)}{J} + \frac{\xi_x}{J} \left(\frac{\gamma \mu}{(\gamma - 1) P_r} \left(\frac{P}{\rho} \right)_x + u \tau_{xx} + v \tau_{xy} \right)$$

$$+ \frac{\xi_y}{J} \left(\frac{\gamma\mu}{(\gamma-1)Pr} \left(\frac{p}{\rho} \right)_y + u\tau_{yx} + v\tau_{yy} \right)$$

$$f_5 = 0$$

$$f_6 = 0$$

ξ -flux vector components

$$f_1 = \hat{m} y_{\eta}^J - \hat{n} x_{\eta}^J$$

$$f_2 = \frac{\hat{m}^2}{\rho} y_{\eta}^J - \frac{\hat{m} \hat{n}}{\rho} x_{\eta}^J + y_{\eta}^J (\gamma-1) \left\{ \hat{e} - \frac{1}{2} \frac{\hat{m}^2}{\rho} - \frac{1}{2} \frac{\hat{n}^2}{\rho} \right\}$$

$$+ \frac{2}{3} \mu y_{\eta} \left\{ 2J y_{\eta} \left(\frac{\hat{m}}{\rho} \right)_{\xi} - 2J y_{\xi} \left(\frac{\hat{m}}{\rho} \right)_{\eta} + J x_{\eta} \left(\frac{\hat{n}}{\rho} \right)_{\xi} - J x_{\xi} \left(\frac{\hat{n}}{\rho} \right)_{\eta} \right\}$$

$$+ \mu x_{\eta} \left\{ - J x_{\eta} \left(\frac{\hat{m}}{\rho} \right)_{\xi} + J x_{\xi} \left(\frac{\hat{m}}{\rho} \right)_{\eta} + J y_{\eta} \left(\frac{\hat{n}}{\rho} \right)_{\xi} - J y_{\xi} \left(\frac{\hat{n}}{\rho} \right)_{\eta} \right\}$$

$$f_3 = \frac{\hat{m}}{\hat{\rho}} \frac{\hat{n}}{\hat{\rho}} y_{\eta}^J - \frac{\hat{n}^2}{\hat{\rho}} x_{\eta}^J - x_{\eta}^{J(\gamma-1)} \left\{ \hat{e} - \frac{1}{2} \frac{\hat{m}^2}{\hat{\rho}} - \frac{1}{2} \frac{\hat{n}^2}{\hat{\rho}} \right\}$$

$$+ \mu y_{\eta} \left\{ -x_{\eta}^{J(\frac{\hat{m}}{\hat{\rho}})}_{\xi} + x_{\xi}^{J(\frac{\hat{m}}{\hat{\rho}})}_{\eta} + y_{\eta}^{J(\frac{\hat{n}}{\hat{\rho}})}_{\xi} - y_{\xi}^{J(\frac{\hat{n}}{\hat{\rho}})}_{\eta} \right\}$$

$$- \frac{2}{3} \mu x_{\eta} \left\{ -2Jx_{\eta}^{J(\frac{\hat{n}}{\hat{\rho}})}_{\xi} + 2Jx_{\xi}^{J(\frac{\hat{n}}{\hat{\rho}})}_{\eta} - y_{\eta}^{J(\frac{\hat{m}}{\hat{\rho}})}_{\xi} + y_{\xi}^{J(\frac{\hat{m}}{\hat{\rho}})}_{\eta} \right\}$$

$$f_4 = \left\{ \gamma \hat{e} - \frac{\gamma-1}{2} \left(\frac{\hat{m}^2}{\hat{\rho}} + \frac{\hat{n}^2}{\hat{\rho}} \right) \right\} \left\{ y_{\eta}^{J(\frac{\hat{m}}{\hat{\rho}})}_{\xi} - x_{\eta}^{J(\frac{\hat{n}}{\hat{\rho}})}_{\xi} \right\}$$

$$+ \frac{\gamma\mu}{Pr} y_{\eta} \left\{ y_{\eta}^{J(\frac{\hat{e}}{\hat{\rho}})}_{\xi} - \frac{1}{2} \frac{\hat{m}^2}{\hat{\rho}^2} - \frac{1}{2} \frac{\hat{n}^2}{\hat{\rho}^2} \right\}_{\xi} - y_{\xi}^{J(\frac{\hat{e}}{\hat{\rho}})}_{\eta} \left\{ \frac{\hat{e}}{\hat{\rho}} - \frac{1}{2} \frac{\hat{m}^2}{\hat{\rho}^2} - \frac{1}{2} \frac{\hat{n}^2}{\hat{\rho}^2} \right\}_{\eta}$$

$$\begin{aligned}
& - \frac{\gamma\mu}{Pr} x_{\eta} \left\{ - x_{\eta}^J \left[\frac{\hat{e}}{\rho} - \frac{1}{2} \frac{\hat{m}^2}{\rho^2} - \frac{1}{2} \frac{\hat{n}^2}{\rho^2} \right]_{\xi} + x_{\xi}^J \left[\frac{\hat{e}}{\rho} - \frac{1}{2} \frac{\hat{m}^2}{\rho^2} - \frac{1}{2} \frac{\hat{n}^2}{\rho^2} \right]_{\eta} \right\} \\
& + y_{\eta} \left(\frac{\hat{m}}{\rho} \right) \frac{2}{3\mu} \left[2y_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} - 2y_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} + x_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} - x_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} \right] \\
& + y_{\eta} \left(\frac{\hat{n}}{\rho} \right) \mu \left[-x_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} + x_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} + y_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} - y_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} \right] \\
& - x_{\eta} \left(\frac{\hat{m}}{\rho} \right) \mu \left[-x_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} + x_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} + y_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} - y_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} \right] \\
& - x_{\eta} \left(\frac{\hat{n}}{\rho} \right) \frac{2}{3} \mu \left[-2x_{\eta}^J \left(\frac{\hat{n}}{\rho} \right)_{\xi} + 2x_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} - y_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} + y_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} \right]
\end{aligned}$$

$$f_5 = 0$$

$$f_6 = 0$$

The term $\left[\frac{\hat{e}}{\rho} - \frac{1}{2} \frac{\hat{m}^2}{\rho^2} - \frac{1}{2} \frac{\hat{n}^2}{\rho^2} \right]_{\xi}$ can be expanded as

$$= \left[\frac{\hat{e}}{\hat{\rho}} \xi - \frac{\hat{e}}{\hat{\rho}^2} \hat{\rho} \xi - \frac{\hat{m}}{\hat{\rho}^2} \hat{m} \xi + \frac{\hat{m}^2}{\hat{\rho}^3} \hat{\rho} \xi - \frac{\hat{n}}{\hat{\rho}^2} \hat{n} \xi + \frac{\hat{n}^2}{\hat{\rho}^2} \hat{\rho} \xi \right]$$

likewise for the η derivative

$$[]_{\eta} = \left[\frac{\hat{e}}{\hat{\rho}} \eta - \frac{\hat{e}}{\hat{\rho}^2} \hat{\rho} \eta - \frac{\hat{m}}{\hat{\rho}^2} \hat{m} \eta + \frac{\hat{m}^2}{\hat{\rho}^3} \hat{\rho} \eta - \frac{\hat{n}}{\hat{\rho}^2} \hat{n} \eta + \frac{\hat{n}^2}{\hat{\rho}^3} \hat{\rho} \eta \right]$$

the components of the η - flux vector are

$$g_1 = \frac{\rho u}{J} \eta_x + \frac{\rho v}{J} \eta_y$$

$$g_2 = \frac{\rho u^2}{J} \eta_x + \frac{\rho uv}{J} \eta_y + \frac{p}{J} \eta_x + \frac{\tau_{xx}}{J} \eta_x + \frac{\tau_{xy}}{J} \eta_y$$

$$g_3 = \frac{\rho uv}{J} \eta_x + \frac{\rho v^2}{J} \eta_y + \frac{p}{J} \eta_y + \frac{\tau_{yx}}{J} \eta_x + \frac{\tau_{yy}}{J} \eta_y$$

$$g_4 = \frac{(e+p)}{J} (\eta_x u + \eta_y v) + \frac{\eta_x}{J} \left(\frac{\gamma\mu}{(\gamma-1)Pr} \left(\frac{p}{\rho} \right)_x + u\tau_{xx} + v\tau_{xy} \right) \\ + \frac{\eta_y}{J} \left(\frac{\gamma\mu}{(\gamma-1)Pr} \left(\frac{p}{\rho} \right)_y + u\tau_{yx} + v\tau_{yy} \right)$$

$$g_5 = 0$$

$$g_6 = 0$$

η -Flux vector components

$$g_1 = - \hat{m} y_{\xi}^J + \hat{n} x_{\xi}^J$$

$$g_2 = - \frac{\hat{m}^2}{\rho} y_{\xi}^J + \frac{\hat{m} \hat{n}}{\rho} x_{\xi}^J - y_{\xi}^J (\gamma-1) \left[\hat{e} - \frac{1}{2} \frac{\hat{m}^2}{\rho} - \frac{1}{2} \frac{\hat{n}^2}{\rho} \right]$$

$$- \frac{2}{3} \mu y_{\xi} \left\{ 2 y_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} - 2 y_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} + x_{\eta}^J \left(\frac{\hat{n}}{\rho} \right)_{\xi} - x_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} \right\}$$

$$+ \mu x_{\xi} \left\{ -x_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} + x_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} + y_{\eta}^J \left(\frac{\hat{n}}{\rho} \right)_{\xi} - y_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} \right\}$$

$$g_3 = - \frac{\hat{m} \hat{n}}{\rho} y_{\xi}^J + \frac{\hat{n}^2}{\rho} x_{\xi}^J + x_{\xi}^J (\gamma-1) \left[\hat{e} - \frac{1}{2} \frac{\hat{m}^2}{\rho} - \frac{1}{2} \frac{\hat{n}^2}{\rho} \right]$$

$$- \mu y_{\xi} \left\{ -x_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} + x_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} + y_{\eta}^J \left(\frac{\hat{n}}{\rho} \right)_{\xi} - y_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} \right\}$$

$$+ \frac{2}{3} \mu x_{\xi} \left\{ -2x_{\eta}^J \left(\frac{\hat{n}}{\rho} \right)_{\xi} + 2x_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} - y_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} + y_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} \right\}$$

$$g_4 = \left\{ \gamma \hat{e} - \frac{\gamma-1}{2} \left(\frac{\hat{m}^2}{\rho} + \frac{\hat{n}^2}{\rho} \right) \right\} \left\{ -y_{\xi}^J \left(\frac{\hat{m}}{\rho} \right) + x_{\xi}^J \left(\frac{\hat{n}}{\rho} \right) \right\}$$

$$- \frac{\gamma \mu}{Pr} y_{\xi} \left\{ y_{\eta}^J \left[\frac{\hat{e}}{\rho} - \frac{1}{2} \frac{\hat{m}^2}{\rho} - \frac{1}{2} \frac{\hat{n}^2}{\rho} \right]_{\xi} - y_{\xi}^J \left[\frac{\hat{e}}{\rho} - \frac{1}{2} \frac{\hat{m}^2}{\rho} - \frac{1}{2} \frac{\hat{n}^2}{\rho} \right]_{\eta} \right\}$$

$$- \frac{\gamma u}{Pr} x_{\xi} \left\{ -x_{\eta}^J \left[\frac{\hat{e}}{\rho} - \frac{1}{2} \frac{\hat{m}^2}{\rho} - \frac{1}{2} \frac{\hat{n}^2}{\rho} \right]_{\xi} + x_{\xi}^J \left[\frac{\hat{e}}{\rho} - \frac{1}{2} \frac{\hat{m}^2}{\rho} - \frac{1}{2} \frac{\hat{n}^2}{\rho} \right]_{\eta} \right\}$$

$$- y_{\xi} \left(\frac{\hat{m}}{\rho} \right) \frac{2}{3} \mu \left[2y_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} - 2y_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} + x_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} - x_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} \right]$$

$$- y_{\xi} \left(\frac{\hat{n}}{\rho} \right) \mu \left[-x_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} + x_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} + x_{\eta}^J \left(\frac{\hat{n}}{\rho} \right)_{\xi} - y_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} \right]$$

$$+ x_{\xi} \left(\frac{\hat{m}}{\rho} \right) \mu \left[-x_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} + x_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} + y_{\eta}^J \left(\frac{\hat{n}}{\rho} \right)_{\xi} - y_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} \right]$$

$$+ x_{\xi} \left(\frac{\hat{n}}{\rho} \right) \frac{2}{3} \mu \left[-2x_{\eta}^J \left(\frac{\hat{n}}{\rho} \right)_{\xi} + 2x_{\xi}^J \left(\frac{\hat{n}}{\rho} \right)_{\eta} - y_{\eta}^J \left(\frac{\hat{m}}{\rho} \right)_{\xi} + y_{\xi}^J \left(\frac{\hat{m}}{\rho} \right)_{\eta} \right]$$

$$g_5 = 0$$

$$g_6 = 0$$

We need to compute the following Jacobian terms

$$\frac{\partial f}{\partial w}; \frac{\partial f}{\partial w_{\xi}}; \frac{\partial f}{\partial w_{\eta}} : \text{ Each of these will be a } 4 \times 4 \text{ matrix}$$

$\frac{\partial^2 f}{\partial w^2}, \frac{\partial^2 f}{\partial w_\xi^2}, \frac{\partial^2 f}{\partial w_\eta^2}$: Each of these will be a 4x4x4 matrix

$\frac{\partial^2 f}{\partial w \partial w_\xi}, \frac{\partial^2 f}{\partial w \partial w_\eta}, \frac{\partial^2 f}{\partial w_\xi \partial w_\eta}$: Each of these will be a 4x4x4 matrix

Also the same for the y-flux vector, g.

This is going to take forever to do by hand, so we will use MACSYMA.

Generation of the Flux Vector Jacobian Code

To evaluate the error terms derived in the preceding sections, code must be generated to compute the magnitude of these terms at each discrete point in the flowfields. This evaluation may be performed for as many time steps as desired in order both spatial and temporal variation of the truncation errors.

The error terms themselves are not exceedingly difficult to code, once derived, although they require many vector and matrix operations. The major difficulty is the generation of code to compute the elements of the Jacobian matrices and tensors which appear throughout the truncation error terms. By example, the second Jacobians of the flux vectors contain 64 elements and the third Jacobians contain 256 elements. There are potentially 9

second Jacobians and 27 third Jacobians. Of each element required only one line of code, these two sets would require 7488 lines. The fourth Jacobians would require an additional 82,944 lines of code on the same basis. Since each element may require many lines of code, in particular for the case of flow dependent eddy viscosity, the probability of generating this code by hand without error is not large.

The symbolic manipulation language MACSYMA (c Symbolics, Inc.) version 309 was therefore used to produce the computer code necessary to evaluate the Jacobians. This was not done without difficulty, however. The first attempts to produce code using MACSYMA for the elements of the Jacobians met the same fate as the attempts to derive the modified equations using MACSYMA i.e., the size of the many elements grew until the storage capacity of version 309 was exceeded. As a counter to this problem, factoring routines were developed to attempt to reduce the size of each element after it was generated. These routines were only partially successful and required as much as 2 days of interactive time to reduce each element. Even then, the code for some of the elements exceeded the allowable limit for FORTRAN continuation statements.

The final resolution of this difficulty came from a suggestion by Wigton (Ref. 10) for a means of taking complex derivatives using MACSYMA. His basic idea was extended, streamlined and automated so that FORTRAN code for the entire set of first, second and third Jacobians could be generated in 3 to 5 hours of interactive time (depending on machine load). The routines for performing this task will be explained below and included in Appendix A in full. The FORTRAN code generated using these routines is included in Appendix B.

The crucial idea by Wigton is the use of the "GRADEF" function in MACSYMA to assign names to derivatives of functions. The important point (that is not explained completely in the MACSYMA manual) is that if the original value of the function is removed after the derivative is taken and the name is assigned using GRADEF, then MACSYMA will subsequently substitute automatically the assigned name for the appropriate derivative of the function. The reduction in size of subsequent expressions containing this derivative (if lengthy) is obvious. This idea is applied using the MACSYMA macro "BUILDQ", also as suggested by Wigton.

Before explaining the routines, the definitions of the variables used to generate the flux Jacobians will be given for one of the flux vectors in conservative form:

$$q = \begin{bmatrix} r \\ m \\ n \\ e \end{bmatrix} \quad \text{where} \quad \begin{array}{l} r = \rho \\ m = \rho u \\ n = \rho v \\ e = e_t \end{array}$$

$$cau = capu = \frac{n}{r} \zeta_y + \frac{m}{r} \zeta_x$$

$$cav = capv = \frac{n}{r} \eta_y + \frac{m}{r} \eta_x$$

$$duz = duzeta = \left(\frac{m}{r} \right) \eta$$

$$duz = duzeta = \left(\frac{n}{r} \right) \zeta$$

$$due = dueta = \left(\frac{m}{r} \right) \eta$$

$$dre = dueta = \left(\frac{n}{r} \right) \zeta$$

$$dez = dezeta = (e_i) \eta$$

$$dee = deeta = (e_i) \zeta$$

$$\tau_{xx} = \mu [- (dvz) zty - (dve) ety + z ((duz) ztx + (due) etx)]$$

$$\tau_{xy} = \mu [(duz) zty + (due) ety + (dvz) zty + (dve) etx]$$

$$bx = (\text{gam}) \frac{\mu}{\rho r} [(dez) ztx + (dee) etx] + m/r \tau_{xx} + \frac{n}{r} \tau_{xy}$$

$$\text{then } F = \begin{bmatrix} m \\ m^2/r + p - \tau_{xx} \\ mn/r - \tau_{xy} \\ (e + p) m/r - bx \end{bmatrix}$$

Once the derivatives are computed using the above variables, then a routine is used to substitute the variables used in the computer codes into which the Jacobians are to be inserted.

Four basic types of macros were written for this task. Each was written to be called on a given variable or vector to perform part of the necessary operations. The first step is to differentiate and name the derivatives of such functions as duz, cau, cav, etc. as defined above. These macros are proc____, an example of which is given below:

```
proc2(var):=
  buildq([var],
    (for ii:0 thru 3 do( te: diff(var,q[ii]),
      if te ≠ 0 then (for jj:0 thru 3 do
        (tee:diff(te,q[jj]),
          if tee ≠ 0 then ( gensub(tee),
            outputgen(var,nvar,ii,jj),
            apply('gradef.[concat('var','d,ii),q[jj],concat
              ('var','dd,ii,jj]])))))))))$
```

The proc2 macro shown here is used to create the derivatives and the names that will be substituted for the derivatives in subsequent appearances of the derivative in the second Jacobians. If called on duz, the definition of duz is substituted

sequentially for all appearances of the dummy variable VAR. The macro differentiates duz wrt the first element of q and loads the result into tee. If this is nonzero, then it differentiates wrt the first element of q again and if still nonzero substitutes the actual variables to be used in the FORTRAN code using the macro GENSUB. The FORTRAN code is then generated and displayed as text with an output__ MACRO.

```
outputgen(arn,nd,ii,jj):=
  buildq([arn,nd,ii,jj],FORTRAN(concat('arn','dd,ii,jj)=nd))$
```

Finally, the APPLY, GRADIF, and CONCAT functions are used to designate the derivative of a wrt b the name c.

An example of the FORTRAN code produced by the proc2 routine is:

```
duzdd00=2*roudzt(kv,jv)/rho(kv,jv,1)**3-6*rhodzt(kv,jv)*rhov(kv,1
  jv,1)/rho(kv,jv,1)**4
```

In reality, these routines can be called sequentially on a single function as follows:

```
procall(varr):=buildq([varr],(unmod(varr),proc(varr),procu(varr)
  ,procv(varr),proc2(varr),proc2(varr),proc2pu(varr),proc2pv(v
  arr),proc2up(varr),proc2vp(varr),proc2uu(varr),proc2uv(varr)
  ,proc2vu(varr),proc2vv(varr),remvalue(varr)))$
```

Once all of the nonzero derivatives of the components of the flux vectors have been generated and named, the Jacobians themselves can be generated using the ARRG__ macros:

```

arrgpp(var):=
  buildq([var],
    (for ii:0 thru 3 do(
      for jj:0 thru 3 do (te:diff(var[ii],q[jj]),
        for kk:0 thru 3 do (tee:diff(te,q[kk]),gensub(tee),
          fortran(concat('var','pp',"(",ii,",",jj,",",kk,"")=
            nvar))))))$

```

These macros are somewhat less complex, as all of the derivatives have been named, so it remains only to differentiate the flux vector components and output the FORTRAN code. In this instance, the CONCAT function is used to generate the array name for Jacobian element. An example of this output is:

```

fpp(3,1,0) =
  (cau*pdd10+caud0*pd1+caud1*pd0+caudd10*(p+rhoe(kv
    ,jv,1,1))-bydd10*zty(kv,jv,1)-  bxdd10*ztx(kv,jv,1))/rd
  j(kv,jv)
fpp(3,1,1) = (cau*pdd11+2*caud1*pd1-bydd11*zty(kv,jv,1)
  -bxdd11*ztx1(kv,jv,1))/rdj(kv,jv)

```

The naming conventions used are as follows:

For derivatives of functions:

function name +	$\begin{matrix} d \\ u \\ r \end{matrix}$	$\left \begin{array}{c} \text{diff.wrt} \end{array} \right $	$\begin{matrix} q \\ q_1 \\ q_m \end{matrix}$	+	$\begin{matrix} 0 \\ 1 \\ 2 \\ 3 \end{matrix}$	$\left \begin{array}{c} \text{element of} \\ q, \text{ etc.} \end{array} \right $
-----------------	---	---	---	---	--	--

The flux Jacobians use the same conventions except that p is substituted for d.

For instance,

$$\text{duzddoo} = \frac{\partial^2 \left(\frac{m}{r} \right)_h}{\partial r \partial r}$$

$$\text{and fpp}(3,1,0) = \frac{\partial(f_3)}{\partial m \partial r}$$

where f_3 is the fourth element of the flux vector f .

The 1st, 2nd, and 3rd Jacobians along with all of the necessary derivative definitions are given in Appendix A.

VI. Supersonic Turbulent Flow over a Compression Ramp

The physical problem to be analyzed in this study is a supersonic turbulent flow over a compression ramp. This problem was investigated by Shang and Hankey (Ref. 8) using the MacCormack explicit scheme (Ref. 7) to solve the compressible Navier Stokes equations. The Cebeci-Smith eddy viscosity model modified by Shang and Hankey is used to simulate the turbulence.

The numerical code used for the results presented in this section was provided by Shang and is described in Reference 8. A computational mesh of 62x30 points with some clustering at the corner of the ramp and the same type of stretching in the normal direction as reported in Reference 8 is used. The freestream Mach number is 2.96 and the Reynolds number based upon the leading plate length is 10^7 . The grid is shown in Figure 1. The Mach contours and surface pressures in the neighborhood of the compression corner are shown in Figures 2 and 3, respectively.

Although the grid is very coarse by present day standards, it will provide a starting point for our investigation of the influence of truncation error on the eddy viscosity. In subsequent calculation we expect to refine the mesh to find out, among other things, to what level the grid must be refined so that the truncation errors do not influence the eddy viscosity levels. Or, in other words, what level of grid refinement is necessary before we can be assured that the eddy viscosity model is indeed modelling the physics and not just correcting for the numerical truncation errors.

VII. Results

Presently the code required to calculate the truncation error terms (or the numerical shear stress terms) using the FORTRAN code generated by MACSYMA does not run properly. Therefore, no results will be presented yet. We expect to do this in the near future.

VIII. Discussion

Analysis of Truncation Error Terms

During the course of previous analyses (Refs. 5 and 6) of truncation errors for Lax-Wendroff schemes applied to the Euler equations, we found that the leading second-order truncation error term was at least two orders of magnitude longer than the third-order term.

Since the second-order term is a third derivative (dispersive only for a linear equation) and since the viscous stress terms are second derivatives (usually considered to be dissipative), it would seem that little interaction between the stress terms and the error terms would occur as the third-order term (fourth derivative) is very small. We will demonstrate both analytically and numerically that for a nonlinear equation, large dissipative and dispersive effects can result from the leading term even though only one effect might at first be presumed based on the apparent order of the derivative. Since the leading term predominates for Lax-Wendroff schemes, it is unnecessary to go through the extremely laborious process of examining the higher order terms.

To begin, the viscous Burgers equation is presented as a model equation, both in linear and nonlinear forms.

$$w_t + \left(\frac{w^2}{2} \right)_x = (\mu w_x)_x = \mu_x w_x + \mu w_{xx}$$

where $\mu = \mu(x)$

and the linearized version is

$$w_t + cw_x = (\mu w_x)_x = \mu_x w_x + \mu w_{xx}$$

To provide a base for further discussion, a traveling wave solution is assumed for this equation of where k is a wave number and w is a frequency.

$$w = e^{i(kx - \omega t)}$$

differentiation of this wave wrt space and time yields

$$w_t = -i\omega e^{i(kx - \omega t)}$$

$$w_x = ik e^{i(kx - \omega t)}$$

$$w_{xx} = k^2 e^{i(kx - \omega t)}$$

$$w_{xxx} = -ik^3 e^{i(kx - \omega t)}$$

$$w_{xxxx} = k^4 e^{i(kx - \omega t)}$$

Substitute the appropriate derivatives into the linearized Burgers equation.

$$-i\omega e^{i(kx - \omega t)} + c i k e^{i(kx - \omega t)} = \mu_x i k e^{i(kx - \omega t)} = -\mu k^2 e^{i(kx - \omega t)}$$

Solve for ω

$$-\omega = -c k + \mu_x k + \mu k^2 i$$

This equation is in the form suggested by Whitham (Ref. 9) for determining whether an equation produced dispersion between traveling waves of different frequency. Whitham states that for

an equation of the form $\omega = W(k)$, the equation will produce dispersion if the equation $\omega = W(k)$ is real and if

$$\frac{\partial W(\bar{k})}{\partial k_i \partial k_j} \neq 0$$

The linear heat equation $-i\omega = +k^2\alpha$ or $\omega = ik^2\alpha$. This equation violates the first of Whithaus criteria for dispersion, as we would expect to be the case since physically this linear equation is completely dissipative. We will now use this criteria to examine the nature of the error terms in the modified equation for Burgers equation.

The modified equation for FTOS differencing of the nonlinear Burgers equation is

$$\begin{aligned} w_t + (w^2/2)_x &= \mu w_{xx} + \mu_x w_x \\ &+ \frac{\Delta x^2}{6} \{ 6 w_x w_{xx} + 2w w_{xxx} \} \\ &+ \frac{\Delta x^3}{24} \{ 6 w_{xx}^2 + 8 w_x w_{3x} + 2w w_{4x} \} \end{aligned}$$

We know from physical considerations that the first term on the right hand side of this equation is dissipative; the second term is on cursory examination primarily dispersive. If we wish to determine the interaction between the modified equation truncation error terms and the stress terms in the original equation, then the nature of the modified equation terms must be examined.

First an equation is created consisting of only the time term and the leading modified equation terms:

$$w_t = \frac{\Delta x^2}{6} \{ -6w_x w_{xx} + 2w w_{xxx} \}$$

Substituting the assumed solution into this test equation yields:

$$\omega = \frac{\Delta x^2}{6} \{ 4k^3 e^{i(kx-\omega t)} \}$$

or

$$\omega = \frac{\Delta x^2}{6} \{ 4k^3 (\cos \theta + i \sin \theta) \}$$

where $\theta = kx - \omega t$

It is immediately obvious that the first of Whitham's criteria is violated in that $\omega = W(k)$ is not real. At some risk, we conclude then that this term must have both dispersive and dissipative effects.

This conclusion is important since previous work (Ref. 5 and 6) has shown that the leading term is large, that the next term by approximately an order of magnitude for Cornacks method. If this leading term produces dissipative effects, it has the potential of completely overwhelming the dissipative effects of the third-order term which has been thought to be primarily dissipative.

A similar analysis applied to the third order truncation error term yields the equation

$$\omega = \frac{2\Delta x^3}{3} k^4 (i \cos \theta - \sin \theta)$$

We note that this result is similar to that achieved above, but the effect is out of phase. The analysis can be continued by deriving an equation based on the sum of both terms:

$$\omega = \frac{2}{3} \Delta x^2 k^3 \{(\cos \theta - \Delta x k \sin \theta) + i (\sin \theta + \Delta x k \cos \theta)\}$$

We can infer from this equation that the effect of the third order term is to perturb by a small amount the dispersion and dissipation resulting from the second-order term. This perturbation will be locally maximum where the value of the phase angle is such that the dispersion or dissipation due to the second-order term is locally zero.

We can conclude from this analysis that the leading error term of the modified equation produces both dispersive and dissipative effects of equal amplitude for appropriate values of the phase angle θ . We further conclude that the effect of the third-order term is to modify slightly these effects such that dispersion is reduced and dissipation is increased. Based on this analysis and error analysis research cited previously, we maintain that examination of the leading truncation error term is sufficient to determine the major effects on the dissipative eddy viscosity turbulence models.

IX. Concluding Remarks

Error analysis of finite difference equations applied to the full Navier-Stokes equations proved to be an ambitious undertaking, given the tools available at the beginning of the Research. The majority of the problems were caused by reliance on MACSYMA for the rapid and accurate generation of the modified equations and Jacobian matrices. Although very powerful, MACSYMA (version 309) proved not to have the ability to factor complex expressions or the internal storage necessary to allow generation of the modified equations. Initial attempts to generate the Jacobian matrices encountered the same difficulties as for the modified equations. Although these difficulties were partially overcome, it was not until routines were written based on the suggestion by Wigton that these Jacobians could be generated efficiently in only 600 lines of code.

Several important and useful results were developed in the course of this research. The leading error terms for MacCormacks and Beam-Warming methods applied to the full 2-d Navier-Stokes equations were developed. This was a once-and-for-all development as these terms can be used for all future error analyses of these methods. It was also demonstrated that the modified equation for MacCormack's explicit scheme could be developed in compact form.

Very powerful MACSYMA Routines were developed to generate FORTRAN code to compute Jacobian's to third order in only a few hours of interactive time on a VAX 11/785 computer. Note that approximately 6000 lines of code are written automatically during this interactive time. These routines can easily be generalized to produce Jacobians to arbitrary order.

It was also shown that the leading term can produce both dissipative and dispersive effects on the solution. The other error terms can be shown to be perturbations on the leading term. Therefore, it may be necessary to develop only the leading error terms for the majority of methods.

Unfortunately, no numerical error results were obtained as the checkout of the coding of the modified equations was not complete by the expiration of the contract period.

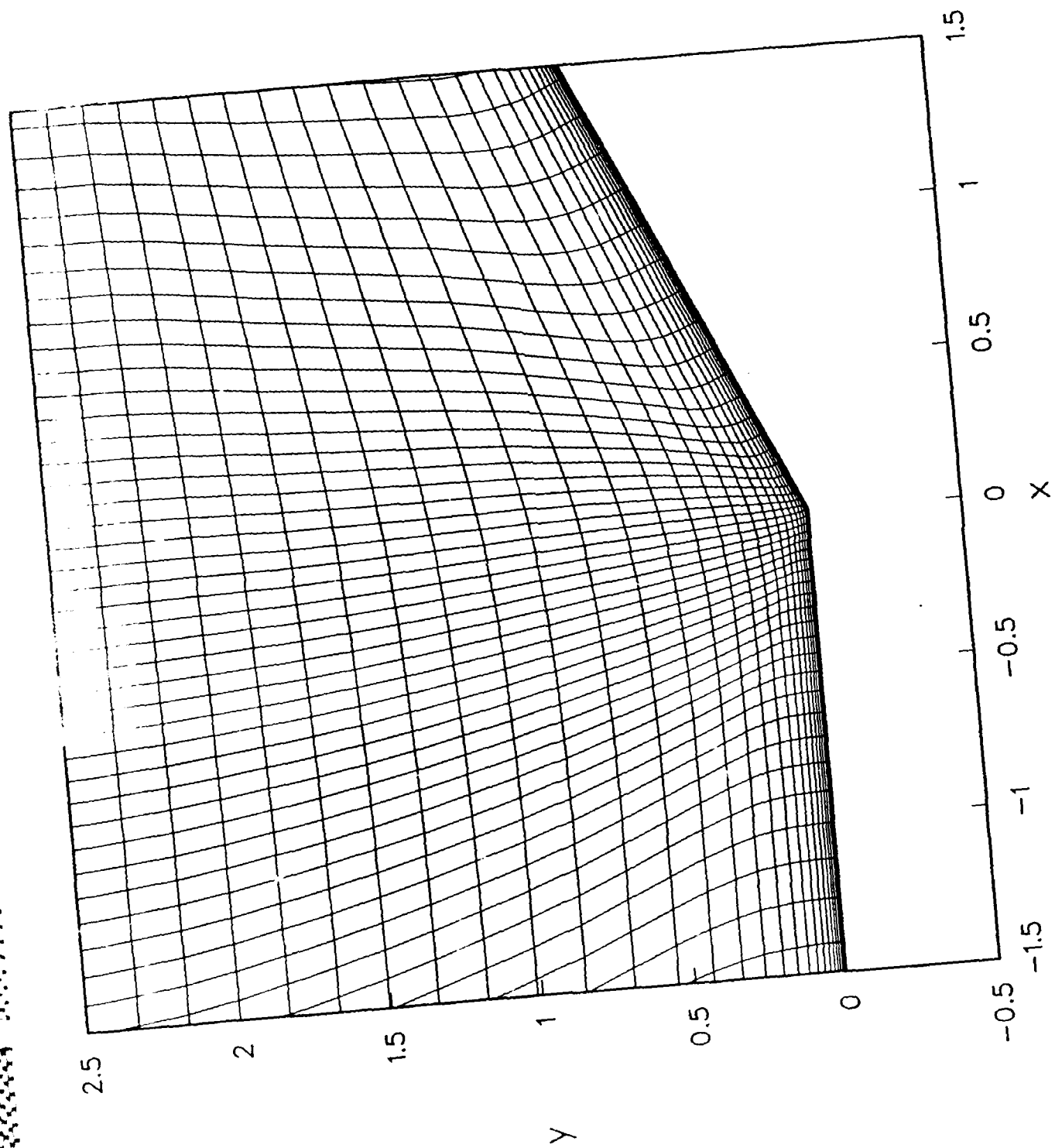


Figure 1. The Computational Grid

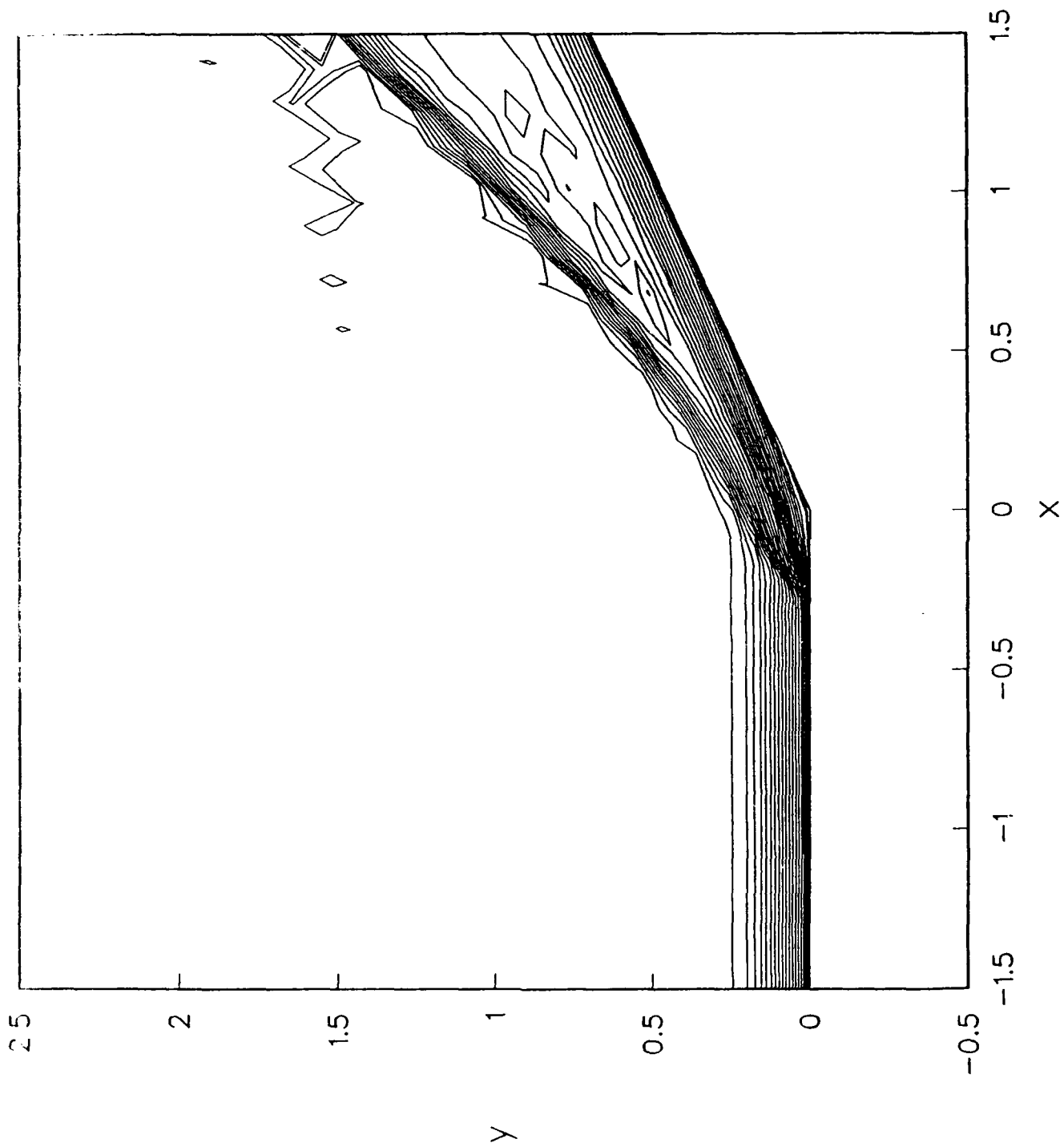


Figure 2. Mach Contours

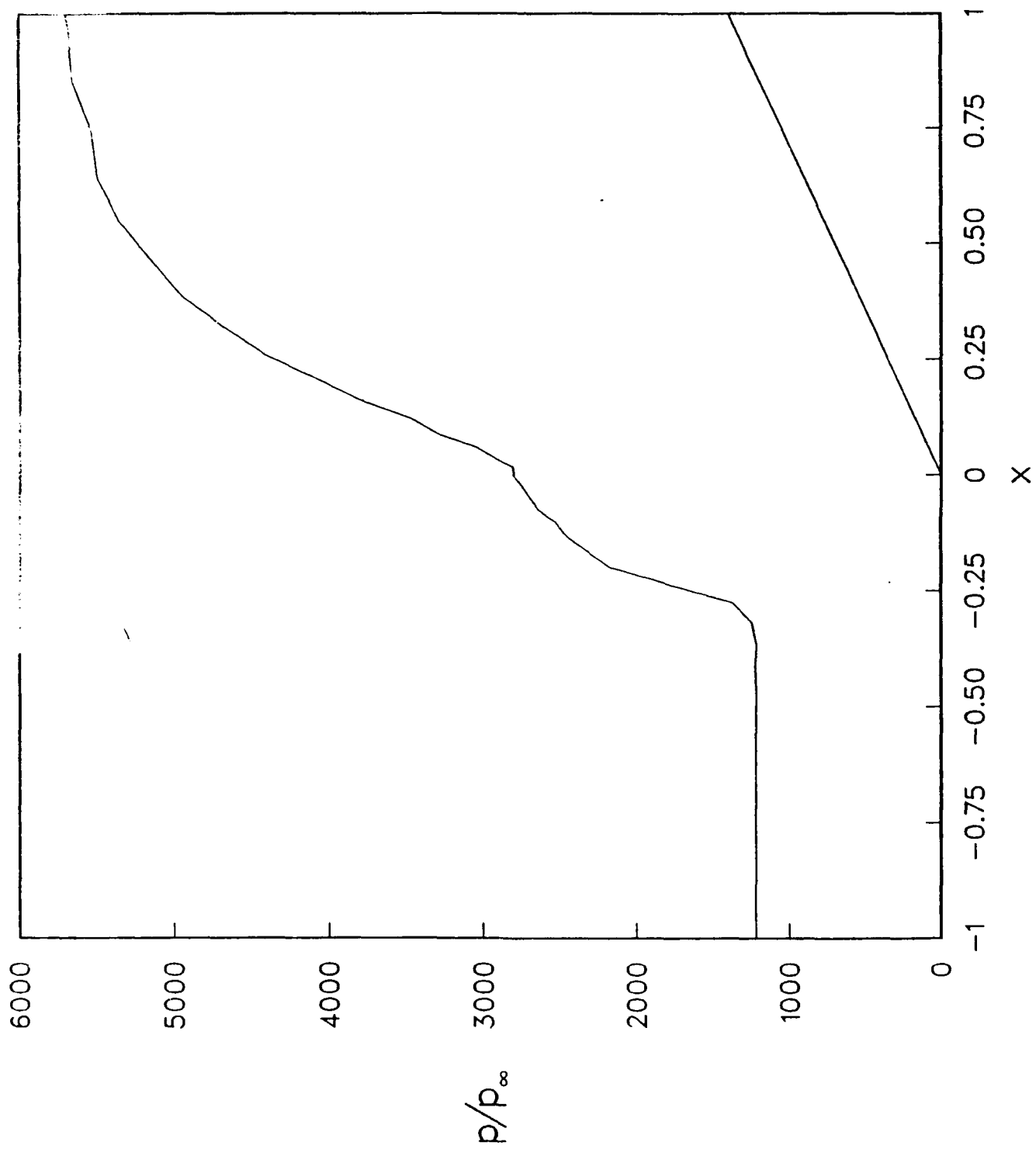


Figure 3. Surface Pressures

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Appendix A

GENERATION OF THE FLUX JACOBIANS AND FORTRAN CODE

As was noted previously, the symbolic manipulation language MACSYMA was used to perform the differentiations necessary to obtain the terms in the flux Jacobians and also to write the necessary FORTRAN code. An extended effort was also made to develop the modified equations using MACSYMA with no success whatsoever. The versions of the package available to the principal investigator during the course of this work had neither the necessary internal storage space nor capable factoring routines that would have been necessary to make the modified equation development possible. During the first attempts to develop the flux jacobians, the same problems were experienced that were encountered in attempting to develop the modified equations. The derivatives of the flux vectors could be taken without incident (at least up to the third Jacobians, when storage problems were again encountered). However, each non-zero element of the Jacobian would result in more lines of code than is permissible under FORTRAN. Techniques and routines were developed for factoring and combining the terms, but as much as 2 days interactive time was required to reduce each element to more manageable size. Even then, some of the elements were beyond the allowable FORTRAN line limit and would have required breaking apart.

This difficulty was overcome through extending a suggestion by Wigton (Ref. 10) for reducing the size of long derivative expressions in MACSYMA. Wigton's suggestion was to first take the derivatives of functions appearing in the expression and to give them separate names. This is a step which makes this useful in that a "GRADEF" function exists in MACSYMA that performs the step "the derivative of F wrt x is to be called name" where name is formed to match that given when the derivative was previously taken. After this step, the value of the original function is removed. MACSYMA will then, when asked to take the

derivative of the function, search the table created by GRADEF and substitute the name that you have given the derivative rather than expression itself. This results in a chaining of the derivatives which results in much shorter FORTRAN expressions.

The above procedure was incorporated in a set of automated routines that will allow FORTRAN code to be produced to compute the first and second Jacobians of the full 2-D Navier-Stokes equations in approximately 2 to 3 hours of interactive time. The third Jacobians require an additional 2 hours. The time savings of this procedure are obvious as approximately 2500 lines of code are generated for the 1st and 2nd Jacobians alone. The complete routines for generating the Jacobians and FORTRAN code are given in Appendix B. A copy of the FORTRAN code generated by these routines is also shown below. In Appendix C is a copy of the Navier-Stokes equations as they were programed for use as a start file for the routines. We will now describe in detail an example of the automated routines.

The routines are all constructed using the macro function "BUILDQ" which is a powerful substitution routine with the capability to call any number of other macros or functions and to pass variables to them. The functions "DIFF", "GRADEF", "CONCAT", "APPLY", "SUBST", AND "FORTRAN" are also used and will be described in turn. The first macros created were the name_ routines, such as:

```
nameu(var,ii):=  
    buildq([var,ii],concat('var','u,ii));
```

This routine passes the arguments var and ii to the concat function which creates a name fu0 for instance if var=f and ii=0. Naming conventions for the derivatives are in general(if q=[r,m,n,e] is the solution vector) that p indicates differentiation wrt q, u indicates diff. wrt the derivative of q by zeta, and v indicates the derivative of

q wrt eta with the number (ii above) indicating which component of q. The next macro created was gensub which substitutes the subscripted variables to be used in the FORTRAN code.

```
gensub(var)::=
  buildq([var],nvar:subst([
    gam = gamma,j = rdj[kv,jv],mu = rrmu[kv,jv],
    ztx = ztx[kv,jv,1],zty = zty[kv,jv,1],
    etx = etx[kv,jv,1],ety = ety[kv,jv,1],
    'DIFF(m,zta,1) = roudzt[kv,jv],
    'DIFF(m,eta,1) = roudet[kv,jv],
    'DIFF(n,zta,1) = rovdzt[kv,jv],
    'DIFF(n,eta,1) = rovdet[kv,jv],
    'DIFF(e,zta,1) = roedzt[kv,jv],
    'DIFF(e,eta,1) = roedet[kv,jv],
    'DIFF(r,zta,1) = rhodzt[kv,jv],
    'DIFF(r,eta,1) = rhodet[kv,jv],
    r = rho[kv,jv,1],m = rhou[kv,jv,1],
    n = rhov[kv,jv,1],e = rhoe[kv,jv,1]],var));
```

The next macro created was output__ which was used to produce FORTRAN code from the Jacobian element loaded into te.

```
outputdu(var,te,ii)::=
  buildq([var,te,ii],
    fortran(nameu(var,ii)=te));
```

These macros were then brought together in the macros proc_ which were used to produce the function derivatives to be used in the Jacobian elements. In the example below, the derivative of var wrt the derivative

of $q[ii]$ wrt to $zeta$ is loaded into te , the substitution made, FORTRAN code output, and the function `apply` is used to apply `grdef` to tell MACSYMA that the derivative of var wrt the derivative of $q[ii]$ wrt $zeta$ is the output of `nameu`.

```

procu(var):=
  buildq([var],
    for ii:0 thru 3 do ( te:diff(var,diff(q[ii],zta)),
      if TE # 0 THEN (gensub(te),outputdu(var,nvar,ii),
        apply('grdef,['var,diff(q[ii],zta),
          nameu(var,ii)]))));

```

A more complex output macro is required for creating the array names and outputting the FORTRAN code for the flux jacobians.

In the following pages the various Jacobians are given. The notation follows that given in Section V.

totrds = 0.6666666666666667

```
cau = rhov(kv,jv,1)*zty(kv,jv,1)/rho(kv,jv,1)+rhov(kv,jv,1)*ztx(kv
1 ,jv,1)/rho(kv,jv,1)
caud0 = -rhov(kv,jv,1)*zty(kv,jv,1)/rho(kv,jv,1)**2-rhov(kv,jv,1)*
1 ztx(kv,jv,1)/rho(kv,jv,1)**2
caud1 = ztx(kv,jv,1)/rho(kv,jv,1)
caud2 = zty(kv,jv,1)/rho(kv,jv,1)
caudd00 = 2*rhov(kv,jv,1)*zty(kv,jv,1)/rho(kv,jv,1)**3+2*rhov(kv,j
1 v,1)*ztx(kv,jv,1)/rho(kv,jv,1)**3
caudd01 = -ztx(kv,jv,1)/rho(kv,jv,1)**2
caudd02 = -zty(kv,jv,1)/rho(kv,jv,1)**2
caudd10 = -ztx(kv,jv,1)/rho(kv,jv,1)**2
caudd20 = -zty(kv,jv,1)/rho(kv,jv,1)**2
caudd00 = 2*rhov(kv,jv,1)*zty(kv,jv,1)/rho(kv,jv,1)**3+2*rhov(kv,j
1 v,1)*ztx(kv,jv,1)/rho(kv,jv,1)**3
caudd01 = -ztx(kv,jv,1)/rho(kv,jv,1)**2
caudd02 = -zty(kv,jv,1)/rho(kv,jv,1)**2
caudd10 = -ztx(kv,jv,1)/rho(kv,jv,1)**2
caudd20 = -zty(kv,jv,1)/rho(kv,jv,1)**2
```

```
cav = ety(kv,jv,1)*rhov(kv,jv,1)/rho(kv,jv,1)+etx(kv,jv,1)*rhov(kv
1 ,jv,1)/rho(kv,jv,1)
cavd0 = -ety(kv,jv,1)*rhov(kv,jv,1)/rho(kv,jv,1)**2-etx(kv,jv,1)*r
1 hou(kv,jv,1)/rho(kv,jv,1)**2
cavd1 = etx(kv,jv,1)/rho(kv,jv,1)
cavd2 = ety(kv,jv,1)/rho(kv,jv,1)
cavdd00 = 2*ety(kv,jv,1)*rhov(kv,jv,1)/rho(kv,jv,1)**3+2*ety(kv,jv
1 ,1)*rhov(kv,jv,1)/rho(kv,jv,1)**3
cavdd01 = -etx(kv,jv,1)/rho(kv,jv,1)**2
cavdd02 = -ety(kv,jv,1)/rho(kv,jv,1)**2
cavdd10 = -etx(kv,jv,1)/rho(kv,jv,1)**2
cavdd20 = -ety(kv,jv,1)/rho(kv,jv,1)**2
cavdd00 = 2*ety(kv,jv,1)*rhov(kv,jv,1)/rho(kv,jv,1)**3+2*ety(kv,jv
1 ,1)*rhov(kv,jv,1)/rho(kv,jv,1)**3
cavdd01 = -etx(kv,jv,1)/rho(kv,jv,1)**2
cavdd02 = -ety(kv,jv,1)/rho(kv,jv,1)**2
cavdd10 = -etx(kv,jv,1)/rho(kv,jv,1)**2
cavdd20 = -ety(kv,jv,1)/rho(kv,jv,1)**2
```

```
p = (rhoe(kv,jv,1)-rho(kv,jv,1)*(rhov(kv,jv,1)**2/rho(kv,jv,1)**2+
1 rhov(kv,jv,1)**2/rho(kv,jv,1)**2)/2.0)*(gamma-1)
pd0 = (-rhov(kv,jv,1)**2/rho(kv,jv,1)**2+rhov(kv,jv,1)**2/rho(kv,
1 jv,1)**2)/2.0-rho(kv,jv,1)*(-2*rhov(kv,jv,1)**2/rho(kv,jv,1)**3
2 -2*rhov(kv,jv,1)**2/rho(kv,jv,1)**3)/2.0)*(gamma-1)
pd1 = -rhov(kv,jv,1)*(gamma-1)/rho(kv,jv,1)
pd2 = -rhov(kv,jv,1)*(gamma-1)/rho(kv,jv,1)
pd3 = gamma-1
pdd00 = (-rho(kv,jv,1)*(6*rhov(kv,jv,1)**2/rho(kv,jv,1)**4+6*rhov(
1 kv,jv,1)**2/rho(kv,jv,1)**4)/2.0+2*rhov(kv,jv,1)**2/rho(kv,jv,1
2 )**3+2*rhov(kv,jv,1)**2/rho(kv,jv,1)**3)*(gamma-1)
pdd01 = rhov(kv,jv,1)*(gamma-1)/rho(kv,jv,1)**2
pdd02 = rhov(kv,jv,1)*(gamma-1)/rho(kv,jv,1)**2
pdd10 = rhov(kv,jv,1)*(gamma-1)/rho(kv,jv,1)**2
pdd11 = -(gamma-1)/rho(kv,jv,1)
pdd20 = rhov(kv,jv,1)*(gamma-1)/rho(kv,jv,1)**2
pdd22 = -(gamma-1)/rho(kv,jv,1)
pdd00 = (-rho(kv,jv,1)*(6*rhov(kv,jv,1)**2/rho(kv,jv,1)**4+6*rhov(
```

```

1 kv,jv,1)**2/rho(kv,jv,1)**4)/2.0+2*rhov(kv,jv,1)**2/rho(kv,jv,1
2 )**3+2*rhou(kv,jv,1)**2/rho(kv,jv,1)**3)*(gamma-1)
pdd01 = rhou(kv,jv,1)*(gamma-1)/rho(kv,jv,1)**2
pdd02 = rhov(kv,jv,1)*(gamma-1)/rho(kv,jv,1)**2
pdd10 = rhou(kv,jv,1)*(gamma-1)/rho(kv,jv,1)**2
pdd11 = -(gamma-1)/rho(kv,jv,1)
pdd20 = rhov(kv,jv,1)*(gamma-1)/rho(kv,jv,1)**2
pdd22 = -(gamma-1)/rho(kv,jv,1)

duz = roudzt(kv,jv)/rho(kv,jv,1)-rhodzt(kv,jv)*rhou(kv,jv,1)/rho(k
1 v,jv,1)**2
duzd0 = 2*rhodzt(kv,jv)*rhou(kv,jv,1)/rho(kv,jv,1)**3-roudzt(kv,jv
1 )/rho(kv,jv,1)**2
duzd1 = -rhodzt(kv,jv)/rho(kv,jv,1)**2
duzu0 = -rhou(kv,jv,1)/rho(kv,jv,1)**2
duzu1 = 1/rho(kv,jv,1)
duzdd00 = 2*roudzt(kv,jv)/rho(kv,jv,1)**3-6*rhodzt(kv,jv)*rhou(kv,
1 jv,1)/rho(kv,jv,1)**4
duzdd01 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
duzdd10 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
duzdd00 = 2*roudzt(kv,jv)/rho(kv,jv,1)**3-6*rhodzt(kv,jv)*rhou(kv,
1 jv,1)/rho(kv,jv,1)**4
duzdd01 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
duzdd10 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
duzdu00 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
duzdu01 = -1/rho(kv,jv,1)**2
duzdu10 = -1/rho(kv,jv,1)**2
duzud00 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
duzud01 = -1/rho(kv,jv,1)**2
duzud10 = -1/rho(kv,jv,1)**2

due = roudet(kv,jv)/rho(kv,jv,1)-rhodet(kv,jv)*rhou(kv,jv,1)/rho(k
1 v,jv,1)**2
dued0 = 2*rhodet(kv,jv)*rhou(kv,jv,1)/rho(kv,jv,1)**3-roudet(kv,jv
1 )/rho(kv,jv,1)**2
dued1 = -rhodet(kv,jv)/rho(kv,jv,1)**2
duev0 = -rhou(kv,jv,1)/rho(kv,jv,1)**2
duev1 = 1/rho(kv,jv,1)
duedd00 = 2*roudet(kv,jv)/rho(kv,jv,1)**3-6*rhodet(kv,jv)*rhou(kv,
1 jv,1)/rho(kv,jv,1)**4
duedd01 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
duedd10 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
duedd00 = 2*roudet(kv,jv)/rho(kv,jv,1)**3-6*rhodet(kv,jv)*rhou(kv,
1 jv,1)/rho(kv,jv,1)**4
duedd01 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
duedd10 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
duedv00 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
duedv01 = -1/rho(kv,jv,1)**2
duedv10 = -1/rho(kv,jv,1)**2
duedv00 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
duedv01 = -1/rho(kv,jv,1)**2
duedv10 = -1/rho(kv,jv,1)**2

dvz = rovdzt(kv,jv)/rho(kv,jv,1)-rhodzt(kv,jv)*rhov(kv,jv,1)/rho(k
1 v,jv,1)**2
dvzd0 = 2*rhodzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**3-rovdzt(kv,jv
1 )/rho(kv,jv,1)**2
dvzd2 = -rhodzt(kv,jv)/rho(kv,jv,1)**2
dvzu0 = -rhov(kv,jv,1)/rho(kv,jv,1)**2

```

```

dvzu2 = 1/rho(kv,jv,1)
dvzdd00 = 2*rovdzt(kv,jv)/rho(kv,jv,1)**3-6*rhodzt(kv,jv)*rhov(kv,
1 jv,1)/rho(kv,jv,1)**4
dvzdd02 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
dvzdd20 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
dvzdd00 = 2*rovdzt(kv,jv)/rho(kv,jv,1)**3-6*rhodzt(kv,jv)*rhov(kv,
1 jv,1)/rho(kv,jv,1)**4
dvzdd02 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
dvzdd20 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
dvzdu00 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
dvzdu02 = -1/rho(kv,jv,1)**2
dvzdu20 = -1/rho(kv,jv,1)**2
dvzud00 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
dvzud02 = -1/rho(kv,jv,1)**2
dvzud20 = -1/rho(kv,jv,1)**2

dve = rovdet(kv,jv)/rho(kv,jv,1)-rhodet(kv,jv)*rhov(kv,jv,1)/rho(k
1 v,jv,1)**2
dved0 = 2*rhodet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**3-rovdet(kv,jv
1 )/rho(kv,jv,1)**2
dved2 = -rhodet(kv,jv)/rho(kv,jv,1)**2
dvev0 = -rhov(kv,jv,1)/rho(kv,jv,1)**2
dvev2 = 1/rho(kv,jv,1)
dvedd00 = 2*rovdet(kv,jv)/rho(kv,jv,1)**3-6*rhodet(kv,jv)*rhov(kv,
1 jv,1)/rho(kv,jv,1)**4
dvedd02 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
dvedd20 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
dvedd00 = 2*rovdet(kv,jv)/rho(kv,jv,1)**3-6*rhodet(kv,jv)*rhov(kv,
1 jv,1)/rho(kv,jv,1)**4
dvedd02 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
dvedd20 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
dvedv00 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
dvedv02 = -1/rho(kv,jv,1)**2
dvedv20 = -1/rho(kv,jv,1)**2
dvevd00 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
dvevd02 = -1/rho(kv,jv,1)**2
dvevd20 = -1/rho(kv,jv,1)**2

dez = -(-2*rhodzt(kv,jv)*rhov(kv,jv,1)**2/rho(kv,jv,1)**3+2*rovdzt
1 (kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**2-2*rhodzt(kv,jv)*rhov(kv,j
2 v,1)**2/rho(kv,jv,1)**3+2*roudzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv
3 ,1)**2)/2.0-rhodzt(kv,jv)*rhoe(kv,jv,1)/rho(kv,jv,1)**2+roedzt(
4 kv,jv)/rho(kv,jv,1)
dez0 = -(6*rhodzt(kv,jv)*rhov(kv,jv,1)**2/rho(kv,jv,1)**4-4*rovdz
1 t(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**3+6*rhodzt(kv,jv)*rhov(kv,
2 jv,1)**2/rho(kv,jv,1)**4-4*roudzt(kv,jv)*rhov(kv,jv,1)/rho(kv,j
3 v,1)**3)/2.0+2*rhodzt(kv,jv)*rhoe(kv,jv,1)/rho(kv,jv,1)**3-roed
4 zt(kv,jv)/rho(kv,jv,1)**2
dez1 = -(2*roudzt(kv,jv)/rho(kv,jv,1)**2-4*rhodzt(kv,jv)*rhov(kv,
1 jv,1)/rho(kv,jv,1)**3)/2.0
dez2 = -(2*rovdzt(kv,jv)/rho(kv,jv,1)**2-4*rhodzt(kv,jv)*rhov(kv,
1 jv,1)/rho(kv,jv,1)**3)/2.0
dez3 = -rhodzt(kv,jv)/rho(kv,jv,1)**2
dezu0 = -(-2*rhov(kv,jv,1)**2/rho(kv,jv,1)**3-2*rhou(kv,jv,1)**2/r
1 ho(kv,jv,1)**3)/2.0-rhoe(kv,jv,1)/rho(kv,jv,1)**2
dezu1 = -rhou(kv,jv,1)/rho(kv,jv,1)**2
dezu2 = -rhov(kv,jv,1)/rho(kv,jv,1)**2
dezu3 = 1/rho(kv,jv,1)
dezdd00 = -(-24*rhodzt(kv,jv)*rhov(kv,jv,1)**2/rho(kv,jv,1)**5+12*

```



```

1   rovdzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-24*rhodzt(kv,jv)*rh
2   ou(kv,jv,1)**2/rho(kv,jv,1)**5+12*roudzt(kv,jv)*rhov(kv,jv,1)/r
3   ho(kv,jv,1)**4)/2.0-6*rhodzt(kv,jv)*rhoe(kv,jv,1)/rho(kv,jv,1)*
4   **4+2*roedzt(kv,jv)/rho(kv,jv,1)**3
   dezdd01 = -(12*rhodzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*roudz
1   t(kv,jv)/rho(kv,jv,1)**3)/2.0
   dezdd02 = -(12*rhodzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*rovdz
1   t(kv,jv)/rho(kv,jv,1)**3)/2.0
   dezdd03 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
   dezdd10 = -(12*rhodzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*roudz
1   t(kv,jv)/rho(kv,jv,1)**3)/2.0
   dezdd11 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
   dezdd20 = -(12*rhodzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*rovdz
1   t(kv,jv)/rho(kv,jv,1)**3)/2.0
   dezdd22 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
   dezdd30 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
   dezdd00 = -(-24*rhodzt(kv,jv)*rhov(kv,jv,1)**2/rho(kv,jv,1)**5+12*
1   rovdzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-24*rhodzt(kv,jv)*rh
2   ou(kv,jv,1)**2/rho(kv,jv,1)**5+12*roudzt(kv,jv)*rhov(kv,jv,1)/r
3   ho(kv,jv,1)**4)/2.0-6*rhodzt(kv,jv)*rhoe(kv,jv,1)/rho(kv,jv,1)*
4   **4+2*roedzt(kv,jv)/rho(kv,jv,1)**3
   dezdd01 = -(12*rhodzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*roudz
1   t(kv,jv)/rho(kv,jv,1)**3)/2.0
   dezdd02 = -(12*rhodzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*rovdz
1   t(kv,jv)/rho(kv,jv,1)**3)/2.0
   dezdd03 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
   dezdd10 = -(12*rhodzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*roudz
1   t(kv,jv)/rho(kv,jv,1)**3)/2.0
   dezdd11 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
   dezdd20 = -(12*rhodzt(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*rovdz
1   t(kv,jv)/rho(kv,jv,1)**3)/2.0
   dezdd22 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
   dezdd30 = 2*rhodzt(kv,jv)/rho(kv,jv,1)**3
   dezdu00 = 2*rhoe(kv,jv,1)/rho(kv,jv,1)**3-(6*rhov(kv,jv,1)**2/rho(
1   kv,jv,1)**4+6*rhou(kv,jv,1)**2/rho(kv,jv,1)**4)/2.0
   dezdu01 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
   dezdu02 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
   dezdu03 = -1/rho(kv,jv,1)**2
   dezdu10 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
   dezdu11 = -1/rho(kv,jv,1)**2
   dezdu20 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
   dezdu22 = -1/rho(kv,jv,1)**2
   dezdu30 = -1/rho(kv,jv,1)**2
   dezud00 = 2*rhoe(kv,jv,1)/rho(kv,jv,1)**3-(6*rhov(kv,jv,1)**2/rho(
1   kv,jv,1)**4+6*rhou(kv,jv,1)**2/rho(kv,jv,1)**4)/2.0
   dezud01 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
   dezud02 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
   dezud03 = -1/rho(kv,jv,1)**2
   dezud10 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
   dezud11 = -1/rho(kv,jv,1)**2
   dezud20 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
   dezud22 = -1/rho(kv,jv,1)**2
   dezud30 = -1/rho(kv,jv,1)**2

   dee = -(-2*rhodet(kv,jv)*rhov(kv,jv,1)**2/rho(kv,jv,1)**3+2*rovdet
1   (kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**2-2*rhodet(kv,jv)*rhov(kv,j
2   v,1)**2/rho(kv,jv,1)**3+2*roudet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv
3   ,1)**2)/2.0-rhodet(kv,jv)*rhoe(kv,jv,1)/rho(kv,jv,1)**2+roedet(
4   kv,jv)/rho(kv,jv,1)

```

```

deed0 = -(6*rhodet(kv,jv)*rhov(kv,jv,1)**2/rho(kv,jv,1)**4-4*rovde
1 t(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**3+6*rhodet(kv,jv)*rhov(kv,
2 jv,1)**2/rho(kv,jv,1)**4-4*rhoudet(kv,jv)*rhov(kv,jv,1)/rho(kv,j
3 v,1)**3)/2.0+2*rhodet(kv,jv)*rhoe(kv,jv,1)/rho(kv,jv,1)**3-roed
4 et(kv,jv)/rho(kv,jv,1)**2
deed1 = -(2*rhoudet(kv,jv)/rho(kv,jv,1)**2-4*rhodet(kv,jv)*rhov(kv,
1 jv,1)/rho(kv,jv,1)**3)/2.0
deed2 = -(2*rovdet(kv,jv)/rho(kv,jv,1)**2-4*rhodet(kv,jv)*rhov(kv,
1 jv,1)/rho(kv,jv,1)**3)/2.0
deed3 = -rhodet(kv,jv)/rho(kv,jv,1)**2
deev0 = -(-2*rhov(kv,jv,1)**2/rho(kv,jv,1)**3-2*rhou(kv,jv,1)**2/r
1 ho(kv,jv,1)**3)/2.0-rhoe(kv,jv,1)/rho(kv,jv,1)**2
deev1 = -rhou(kv,jv,1)/rho(kv,jv,1)**2
deev2 = -rhov(kv,jv,1)/rho(kv,jv,1)**2
deev3 = 1/rho(kv,jv,1)
deedd00 = -(-24*rhodet(kv,jv)*rhov(kv,jv,1)**2/rho(kv,jv,1)**5+12*
1 rovdet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-24*rhodet(kv,jv)*rh
2 ou(kv,jv,1)**2/rho(kv,jv,1)**5+12*rhoudet(kv,jv)*rhov(kv,jv,1)/r
3 ho(kv,jv,1)**4)/2.0-6*rhodet(kv,jv)*rhoe(kv,jv,1)/rho(kv,jv,1)*
4 *4+2*roedet(kv,jv)/rho(kv,jv,1)**3
deedd01 = -(12*rhodet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*roude
1 t(kv,jv)/rho(kv,jv,1)**3)/2.0
deedd02 = -(12*rhodet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*rovde
1 t(kv,jv)/rho(kv,jv,1)**3)/2.0
deedd03 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
deedd10 = -(12*rhodet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*roude
1 t(kv,jv)/rho(kv,jv,1)**3)/2.0
deedd11 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
deedd20 = -(12*rhodet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*rovde
1 t(kv,jv)/rho(kv,jv,1)**3)/2.0
deedd22 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
deedd30 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
deedd00 = -(-24*rhodet(kv,jv)*rhov(kv,jv,1)**2/rho(kv,jv,1)**5+12*
1 rovdet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-24*rhodet(kv,jv)*rh
2 ou(kv,jv,1)**2/rho(kv,jv,1)**5+12*rhoudet(kv,jv)*rhov(kv,jv,1)/r
3 ho(kv,jv,1)**4)/2.0-6*rhodet(kv,jv)*rhoe(kv,jv,1)/rho(kv,jv,1)*
4 *4+2*roedet(kv,jv)/rho(kv,jv,1)**3
deedd01 = -(12*rhodet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*roude
1 t(kv,jv)/rho(kv,jv,1)**3)/2.0
deedd02 = -(12*rhodet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*rovde
1 t(kv,jv)/rho(kv,jv,1)**3)/2.0
deedd03 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
deedd10 = -(12*rhodet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*roude
1 t(kv,jv)/rho(kv,jv,1)**3)/2.0
deedd11 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
deedd20 = -(12*rhodet(kv,jv)*rhov(kv,jv,1)/rho(kv,jv,1)**4-4*rovde
1 t(kv,jv)/rho(kv,jv,1)**3)/2.0
deedd22 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
deedd30 = 2*rhodet(kv,jv)/rho(kv,jv,1)**3
deedv00 = 2*rhoe(kv,jv,1)/rho(kv,jv,1)**3-(6*rhov(kv,jv,1)**2/rho(
1 kv,jv,1)**4+6*rhou(kv,jv,1)**2/rho(kv,jv,1)**4)/2.0
deedv01 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
deedv02 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
deedv03 = -1/rho(kv,jv,1)**2
deedv10 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
deedv11 = -1/rho(kv,jv,1)**2
deedv20 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
deedv22 = -1/rho(kv,jv,1)**2
deedv30 = -1/rho(kv,jv,1)**2

```

```

deevd00 = 2*rhoe(kv,jv,1)/rho(kv,jv,1)**3-(6*rhov(kv,jv,1)**2/rho(
1 kv,jv,1)**4+6*rhou(kv,jv,1)**2/rho(kv,jv,1)**4)/2.0
deevd01 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
deevd02 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
deevd03 = -1/rho(kv,jv,1)**2
deevd10 = 2*rhou(kv,jv,1)/rho(kv,jv,1)**3
deevd11 = -1/rho(kv,jv,1)**2
deevd20 = 2*rhov(kv,jv,1)/rho(kv,jv,1)**3
deevd22 = -1/rho(kv,jv,1)**2
deevd30 = -1/rho(kv,jv,1)**2

```

```

txx = rrmu(kv,jv)*(-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(
1 kv,jv,1)+2.0*due*etx(kv,jv,1))*totrds
txxd0 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+
1 .0*due*etx(kv,jv,1))*mud0*totrds+rrmu(kv,jv)*(-dvzd0*zty(kv,jv,
2 1)+2.0*duzd0*ztx(kv,jv,1)-dved0*ety(kv,jv,1)+2.0*dued0*etx(kv,j
3 v,1))*totrds
txxd1 = rrmu(kv,jv)*(2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*etx(kv,jv,1)
1 )*totrds
txxd2 = rrmu(kv,jv)*(-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*totrd
1 s
txxu0 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2
1 .0*due*etx(kv,jv,1))*muu0*totrds+rrmu(kv,jv)*(2.0*duzu0*ztx(kv,
2 jv,1)-dvzu0*zty(kv,jv,1))*totrds
txxul = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2
1 .0*due*etx(kv,jv,1))*muul*totrds+2.0*duzul*rrmu(kv,jv)*ztx(kv,j
2 v,1))*totrds
txxu2 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2
1 .0*due*etx(kv,jv,1))*muu2*totrds-dvzu2*rrmu(kv,jv)*zty(kv,jv,1)
2 *totrds
txxv0 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2
1 .0*due*etx(kv,jv,1))*muv0*totrds+rrmu(kv,jv)*(2.0*duev0*etx(kv,
2 jv,1)-dvev0*ety(kv,jv,1))*totrds
txxv1 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2
1 .0*due*etx(kv,jv,1))*muv1*totrds+2.0*duev1*rrmu(kv,jv)*etx(kv,j
2 v,1))*totrds
txxv2 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2
1 .0*due*etx(kv,jv,1))*muv2*totrds-dvev2*rrmu(kv,jv)*ety(kv,jv,1)
2 *totrds
txxdd00 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*etx(kv,jv,1))*mudd00*totrds+2*(-dvzd0*zty(kv,jv,1)+2.0
2 *duzd0*ztx(kv,jv,1)-dved0*ety(kv,jv,1)+2.0*dued0*etx(kv,jv,1))*
3 mud0*totrds+rrmu(kv,jv)*(-dvzdd00*zty(kv,jv,1)+2.0*duzdd00*ztx(
4 kv,jv,1)-dvedd00*ety(kv,jv,1)+2.0*duedd00*etx(kv,jv,1))*totrds
txxdd01 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*etx(kv,jv,1))*mud0*tot
1 rds+rrmu(kv,jv)*(2.0*duzdd01*ztx(kv,jv,1)+2.0*duedd01*etx(kv,jv
2 ,1))*totrds
txxdd02 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*mud0*totrds+rrm
1 u(kv,jv)*(-dvzdd02*zty(kv,jv,1)-dvedd02*ety(kv,jv,1))*totrds
txxdd10 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*etx(kv,jv,1))*mud0*tot
1 rds+rrmu(kv,jv)*(2.0*duzdd10*ztx(kv,jv,1)+2.0*duedd10*etx(kv,jv
2 ,1))*totrds
txxdd20 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*mud0*totrds+rrm
1 u(kv,jv)*(-dvzdd20*zty(kv,jv,1)-dvedd20*ety(kv,jv,1))*totrds
txxdd00 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*etx(kv,jv,1))*mudd00*totrds+2*(-dvzd0*zty(kv,jv,1)+2.0
2 *duzd0*ztx(kv,jv,1)-dved0*ety(kv,jv,1)+2.0*dued0*etx(kv,jv,1))*
3 mud0*totrds+rrmu(kv,jv)*(-dvzdd00*zty(kv,jv,1)+2.0*duzdd00*ztx(
4 kv,jv,1)-dvedd00*ety(kv,jv,1)+2.0*duedd00*etx(kv,jv,1))*totrds
txxdd01 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*etx(kv,jv,1))*mud0*tot
1 rds+rrmu(kv,jv)*(2.0*duzdd01*ztx(kv,jv,1)+2.0*duedd01*etx(kv,jv
2 ,1))*totrds
txxdd02 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*mud0*totrds+rrm
1 u(kv,jv)*(-dvzdd02*zty(kv,jv,1)-dvedd02*ety(kv,jv,1))*totrds
txxdd10 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*etx(kv,jv,1))*mud0*tot
1 rds+rrmu(kv,jv)*(2.0*duzdd10*ztx(kv,jv,1)+2.0*duedd10*etx(kv,jv
2 ,1))*totrds
txxdd20 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*mud0*totrds+rrm

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```

1  u(kv,jv)*(-dvzdd20*zty(kv,jv,1)-dvedd20*ety(kv,jv,1))*totrds
   txxdu00 = (-dvzd0*zty(kv,jv,1)+2.0*duzd0*ztx(kv,jv,1)-dved0*ety(kv
1  ,jv,1)+2.0*dued0*etx(kv,jv,1))*muu0*totrds+(-dvz*zty(kv,jv,1)+2
2  .0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*mudu
3  00*totrds+(2.0*duzu0*ztx(kv,jv,1)-dvzu0*zty(kv,jv,1))*mud0*totr
4  ds+rrmu(kv,jv)*(2.0*duzdu0*ztx(kv,jv,1)-dvzdu0*zty(kv,jv,1))*
5  totrds
   txxdu01 = (-dvzd0*zty(kv,jv,1)+2.0*duzd0*ztx(kv,jv,1)-dved0*ety(kv
1  ,jv,1)+2.0*dued0*etx(kv,jv,1))*muu1*totrds+(-dvz*zty(kv,jv,1)+2
2  .0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*mudu
3  01*totrds+2.0*duzu1*ztx(kv,jv,1)*mud0*totrds+2.0*duzdu01*rrmu(k
4  v,jv)*ztx(kv,jv,1)*totrds
   txxdu02 = (-dvzd0*zty(kv,jv,1)+2.0*duzd0*ztx(kv,jv,1)-dved0*ety(kv
1  ,jv,1)+2.0*dued0*etx(kv,jv,1))*muu2*totrds+(-dvz*zty(kv,jv,1)+2
2  .0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*mudu
3  02*totrds-dvzu2*zty(kv,jv,1)*mud0*totrds-dvzdu02*rrmu(kv,jv)*zt
4  y(kv,jv,1)*totrds
   txxdu10 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*etx(kv,jv,1))*muu0*tot
1  rds+2.0*duzdul0*rrmu(kv,jv)*ztx(kv,jv,1)*totrds
   txxdu11 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*etx(kv,jv,1))*muu1*tot
1  rds
   txxdu12 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*etx(kv,jv,1))*muu2*tot
1  rds
   txxdu20 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muu0*totrds-dvz
1  du20*rrmu(kv,jv)*zty(kv,jv,1)*totrds
   txxdu21 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muu1*totrds
   txxdu22 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muu2*totrds
   txxdv00 = (-dvzd0*zty(kv,jv,1)+2.0*duzd0*ztx(kv,jv,1)-dved0*ety(kv
1  ,jv,1)+2.0*dued0*etx(kv,jv,1))*muv0*totrds+(-dvz*zty(kv,jv,1)+2
2  .0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*mudv
3  00*totrds+(2.0*duedv0*etx(kv,jv,1)-dvev0*ety(kv,jv,1))*mud0*totr
4  ds+rrmu(kv,jv)*(2.0*duedv00*etx(kv,jv,1)-dvedv00*ety(kv,jv,1))*
5  totrds
   txxdv01 = (-dvzd0*zty(kv,jv,1)+2.0*duzd0*ztx(kv,jv,1)-dved0*ety(kv
1  ,jv,1)+2.0*dued0*etx(kv,jv,1))*muv1*totrds+(-dvz*zty(kv,jv,1)+2
2  .0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*mudv
3  01*totrds+2.0*duedv1*etx(kv,jv,1)*mud0*totrds+2.0*duedv01*rrmu(k
4  v,jv)*etx(kv,jv,1)*totrds
   txxdv02 = (-dvzd0*zty(kv,jv,1)+2.0*duzd0*ztx(kv,jv,1)-dved0*ety(kv
1  ,jv,1)+2.0*dued0*etx(kv,jv,1))*muv2*totrds+(-dvz*zty(kv,jv,1)+2
2  .0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*mudv
3  02*totrds-dvev2*ety(kv,jv,1)*mud0*totrds-dvedv02*rrmu(kv,jv)*et
4  y(kv,jv,1)*totrds
   txxdv10 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*etx(kv,jv,1))*muv0*tot
1  rds+2.0*duedv10*rrmu(kv,jv)*etx(kv,jv,1)*totrds
   txxdv11 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*etx(kv,jv,1))*muv1*tot
1  rds
   txxdv12 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*etx(kv,jv,1))*muv2*tot
1  rds
   txxdv20 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muv0*totrds-dve
1  dv20*rrmu(kv,jv)*ety(kv,jv,1)*totrds
   txxdv21 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muv1*totrds
   txxdv22 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muv2*totrds
   txxud00 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,i)
1  +2.0*due*etx(kv,jv,1))*muud00*totrds+(-dvzd0*zty(kv,jv,1)+2.0*d
2  uzd0*ztx(kv,jv,1)-dved0*ety(kv,jv,1)+2.0*dued0*etx(kv,jv,1))*mu
3  u0*totrds+(2.0*duzu0*ztx(kv,jv,1)-dvzu0*zty(kv,jv,1))*mud0*totr
4  ds+rrmu(kv,jv)*(2.0*duzud00*ztx(kv,jv,1)-dvzud00*zty(kv,jv,1))*
5  totrds

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txxud01 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*ety(kv,jv,1))*muu0*tot
1 rds+2.0*duzud01*rrmu(kv,jv)*ztx(kv,jv,1)*totrds
txxud02 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muu0*totrds-dvz
1 ud02*rrmu(kv,jv)*zty(kv,jv,1)*totrds
txxud10 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*ety(kv,jv,1))*muud10*totrds+(-dvzd0*zty(kv,jv,1)+2.0*d
2 uzd0*ztx(kv,jv,1)-dved0*ety(kv,jv,1)+2.0*dued0*ety(kv,jv,1))*mu
3 ul*totrds+2.0*duzul*ztx(kv,jv,1)*mud0*totrds+2.0*duzud10*rrmu(k
4 v,jv)*ztx(kv,jv,1)*totrds
txxud11 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*ety(kv,jv,1))*muul*tot
1 rds
txxud12 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muul*totrds
txxud20 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*ety(kv,jv,1))*muud20*totrds+(-dvzd0*zty(kv,jv,1)+2.0*d
2 uzd0*ztx(kv,jv,1)-dved0*ety(kv,jv,1)+2.0*dued0*ety(kv,jv,1))*mu
3 u2*totrds-dvzu2*zty(kv,jv,1)*mud0*totrds-dvzud20*rrmu(kv,jv)*zt
4 y(kv,jv,1)*totrds
txxud21 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*ety(kv,jv,1))*muu2*tot
1 rds
txxud22 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muu2*totrds
txxvd00 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*ety(kv,jv,1))*muvd00*totrds+(-dvzd0*zty(kv,jv,1)+2.0*d
2 uzd0*ztx(kv,jv,1)-dved0*ety(kv,jv,1)+2.0*dued0*ety(kv,jv,1))*mu
3 v0*totrds+(2.0*duev0*ety(kv,jv,1)-dvev0*ety(kv,jv,1))*mud0*totr
4 ds*rrmu(kv,jv)*(2.0*duevd00*ety(kv,jv,1)-dvevd00*ety(kv,jv,1))*
5 totrds
txxvd01 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*ety(kv,jv,1))*muv0*tot
1 rds+2.0*duevd01*rrmu(kv,jv)*ety(kv,jv,1)*totrds
txxvd02 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muv0*totrds-dve
1 vd02*rrmu(kv,jv)*ety(kv,jv,1)*totrds
txxvd10 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*ety(kv,jv,1))*muvd10*totrds+(-dvzd0*zty(kv,jv,1)+2.0*d
2 uzd0*ztx(kv,jv,1)-dved0*ety(kv,jv,1)+2.0*dued0*ety(kv,jv,1))*mu
3 v1*totrds+2.0*duev1*ety(kv,jv,1)*mud0*totrds+2.0*duevd10*rrmu(k
4 v,jv)*ety(kv,jv,1)*totrds
txxvd11 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*ety(kv,jv,1))*muv1*tot
1 rds
txxvd12 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muv1*totrds
txxvd20 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*ety(kv,jv,1))*muvd20*totrds+(-dvzd0*zty(kv,jv,1)+2.0*d
2 uzd0*ztx(kv,jv,1)-dved0*ety(kv,jv,1)+2.0*dued0*ety(kv,jv,1))*mu
3 v2*totrds-dvev2*ety(kv,jv,1)*mud0*totrds-dvevd20*rrmu(kv,jv)*et
4 y(kv,jv,1)*totrds
txxvd21 = (2.0*duzd1*ztx(kv,jv,1)+2.0*dued1*ety(kv,jv,1))*muv2*tot
1 rds
txxvd22 = (-dvzd2*zty(kv,jv,1)-dved2*ety(kv,jv,1))*muv2*totrds
txxuu00 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*ety(kv,jv,1))*muuu00*totrds+2*(2.0*duzu0*ztx(kv,jv,1)-
2 dvzu0*zty(kv,jv,1))*muu0*totrds
txxuu01 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*ety(kv,jv,1))*muuu01*totrds+(2.0*duzu0*ztx(kv,jv,1)-dv
2 zu0*zty(kv,jv,1))*muul*totrds+2.0*duzul*ztx(kv,jv,1)*muu0*totrd
3 s
txxuu02 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*ety(kv,jv,1))*muuu02*totrds+(2.0*duzu0*ztx(kv,jv,1)-dv
2 zu0*zty(kv,jv,1))*muu2*totrds-dvzu2*zty(kv,jv,1)*muu0*totrds
txxuu10 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*ety(kv,jv,1))*muuu10*totrds+(2.0*duzu0*ztx(kv,jv,1)-dv
2 zu0*zty(kv,jv,1))*muul*totrds+2.0*duzul*ztx(kv,jv,1)*muu0*totrd

```

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3 s
txxu11 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*etx(kv,jv,1))*muu11*totrds+4.0*duzul*ztx(kv,jv,1)*muu
2 1*totrds
txxu12 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*etx(kv,jv,1))*muu12*totrds+2.0*duzul*ztx(kv,jv,1)*muu
2 2*totrds-dvzu2*zty(kv,jv,1)*muu1*totrds
txxu20 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*etx(kv,jv,1))*muu20*totrds+(2.0*duzu0*ztx(kv,jv,1)-dv
2 zu0*zty(kv,jv,1))*muu2*totrds-dvzu2*zty(kv,jv,1)*muu0*totrds
txxu21 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*etx(kv,jv,1))*muu21*totrds+2.0*duzul*ztx(kv,jv,1)*muu
2 2*totrds-dvzu2*zty(kv,jv,1)*muu1*totrds
txxu22 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*etx(kv,jv,1))*muu22*totrds-2*dvzu2*zty(kv,jv,1)*muu2*
2 totrds
txxuv00 = (2.0*duzu0*ztx(kv,jv,1)-dvzu0*zty(kv,jv,1))*muv0*totrds+
1 (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*du
2 e*etx(kv,jv,1))*muuv00*totrds+(2.0*duev0*etx(kv,jv,1)-dvev0*ety
3 (kv,jv,1))*muu0*totrds
txxuv01 = (2.0*duzu0*ztx(kv,jv,1)-dvzu0*zty(kv,jv,1))*muv1*totrds+
1 (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*du
2 e*etx(kv,jv,1))*muuv01*totrds+2.0*duev1*etx(kv,jv,1)*muu0*totrd
3 s
txxuv02 = (2.0*duzu0*ztx(kv,jv,1)-dvzu0*zty(kv,jv,1))*muv2*totrds+
1 (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*du
2 e*etx(kv,jv,1))*muuv02*totrds-dvev2*ety(kv,jv,1)*muu0*totrds
txxuv10 = 2.0*duzul*ztx(kv,jv,1)*muv0*totrds+(-dvz*zty(kv,jv,1)+2.
1 0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*muuv1
2 0*totrds+(2.0*duev0*etx(kv,jv,1)-dvev0*ety(kv,jv,1))*muu1*totrd
3 s
txxuv11 = 2.0*duzul*ztx(kv,jv,1)*muv1*totrds+(-dvz*zty(kv,jv,1)+2.
1 0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*muuv1
2 1*totrds+2.0*duev1*etx(kv,jv,1)*muu1*totrds
txxuv12 = 2.0*duzul*ztx(kv,jv,1)*muv2*totrds+(-dvz*zty(kv,jv,1)+2.
1 0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*muuv1
2 2*totrds-dvev2*ety(kv,jv,1)*muu1*totrds
txxuv20 = -dvzu2*zty(kv,jv,1)*muv0*totrds+(-dvz*zty(kv,jv,1)+2.0*d
1 uz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*muuv20*t
2 otrds+(2.0*duev0*etx(kv,jv,1)-dvev0*ety(kv,jv,1))*muu2*totrds
txxuv21 = -dvzu2*zty(kv,jv,1)*muv1*totrds+(-dvz*zty(kv,jv,1)+2.0*d
1 uz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*muuv21*t
2 otrds+2.0*duev1*etx(kv,jv,1)*muu2*totrds
txxuv22 = -dvzu2*zty(kv,jv,1)*muv2*totrds+(-dvz*zty(kv,jv,1)+2.0*d
1 uz*ztx(kv,jv,1)-dve*ety(kv,jv,1)+2.0*due*etx(kv,jv,1))*muuv22*t
2 otrds-dvev2*ety(kv,jv,1)*muu2*totrds
txxvu00 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*etx(kv,jv,1))*muvu00*totrds+(2.0*duzu0*ztx(kv,jv,1)-dv
2 zu0*zty(kv,jv,1))*muv0*totrds+(2.0*duev0*etx(kv,jv,1)-dvev0*ety
3 (kv,jv,1))*muu0*totrds
txxvu01 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*etx(kv,jv,1))*muvu01*totrds+2.0*duzul*ztx(kv,jv,1)*muv
2 0*totrds+(2.0*duev0*etx(kv,jv,1)-dvev0*ety(kv,jv,1))*muu1*totrd
3 s
txxvu02 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*etx(kv,jv,1))*muvu02*totrds-dvzu2*zty(kv,jv,1)*muv0*to
2 trds+(2.0*duev0*etx(kv,jv,1)-dvev0*ety(kv,jv,1))*muu2*totrds
txxvu10 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1 +2.0*due*etx(kv,jv,1))*muvu10*totrds+(2.0*duzu0*ztx(kv,jv,1)-dv

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2  zu0*zty(kv,jv,1))*muvi*tottrds+2.0*duev1*etx(kv,jv,1)*muu0*tottrd
3  s
  txxvu11 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvu11*tottrds+2.0*duzu1*ztx(kv,jv,1)*muv
2  1*tottrds+2.0*duev1*etx(kv,jv,1)*muu1*tottrds
  txxvu12 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvu12*tottrds-dvzu2*zty(kv,jv,1)*muv1*to
2  trds+2.0*duev1*etx(kv,jv,1)*muu2*tottrds
  txxvu20 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvu20*tottrds+(2.0*duzu0*ztx(kv,jv,1)-dv
2  zu0*zty(kv,jv,1))*muv2*tottrds-dvev2*ety(kv,jv,1)*muu0*tottrds
  txxvu21 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvu21*tottrds+2.0*duzu1*ztx(kv,jv,1)*muv
2  2*tottrds-dvev2*ety(kv,jv,1)*muu1*tottrds
  txxvu22 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvu22*tottrds-dvzu2*zty(kv,jv,1)*muv2*to
2  trds-dvev2*ety(kv,jv,1)*muu2*tottrds
  txxvv00 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvv00*tottrds+2*(2.0*duev0*etx(kv,jv,1)-
2  dvev0*ety(kv,jv,1))*muv0*tottrds
  txxvv01 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvv01*tottrds+(2.0*duev0*etx(kv,jv,1)-dv
2  ev0*ety(kv,jv,1))*muv1*tottrds+2.0*duev1*etx(kv,jv,1)*muv0*tottrd
3  s
  txxvv02 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvv02*tottrds+(2.0*duev0*etx(kv,jv,1)-dv
2  ev0*ety(kv,jv,1))*muv2*tottrds-dvev2*ety(kv,jv,1)*muv0*tottrds
  txxvv10 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvv10*tottrds+(2.0*duev0*etx(kv,jv,1)-dv
2  ev0*ety(kv,jv,1))*muv1*tottrds+2.0*duev1*etx(kv,jv,1)*muv0*tottrd
3  s
  txxvv11 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvv11*tottrds+4.0*duev1*etx(kv,jv,1)*muv
2  1*tottrds
  txxvv12 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvv12*tottrds+2.0*duev1*etx(kv,jv,1)*muv
2  2*tottrds-dvev2*ety(kv,jv,1)*muv1*tottrds
  txxvv20 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvv20*tottrds+(2.0*duev0*etx(kv,jv,1)-dv
2  ev0*ety(kv,jv,1))*muv2*tottrds-dvev2*ety(kv,jv,1)*muv0*tottrds
  txxvv21 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvv21*tottrds+2.0*duev1*etx(kv,jv,1)*muv
2  2*tottrds-dvev2*ety(kv,jv,1)*muv1*tottrds
  txxvv22 = (-dvz*zty(kv,jv,1)+2.0*duz*ztx(kv,jv,1)-dve*ety(kv,jv,1)
1  +2.0*due*etx(kv,jv,1))*muvv22*tottrds-2*dvev2*ety(kv,jv,1)*muv2*
2  tottrds

```

txy:mu*(zty*duz+ety*due+ztx*dvz+etx*dve);

```

  txy = rrmu(kv,jv)*(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv
1  ,1)+dve*etx(kv,jv,1))
  txyd0 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*et
1  x(kv,jv,1))*mud0+rrmu(kv,jv)*(duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,j
2  v,1)+dued0*ety(kv,jv,1)+dved0*etx(kv,jv,1))
  txyd1 = rrmu(kv,jv)*(duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))
  txyd2 = rrmu(kv,jv)*(dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))
  txyu0 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*et
1  x(kv,jv,1))*muu0+rrmu(kv,jv)*(duzu0*zty(kv,jv,1)+dvzu0*ztx(kv,j
2  v,1))

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txyu1 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*et
1 x(kv,jv,1))*muu1+duzul*rrmu(kv,jv)*zty(kv,jv,1)
txyu2 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*et
1 x(kv,jv,1))*muu2+dvzu2*rrmu(kv,jv)*ztx(kv,jv,1)
txyv0 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*et
1 x(kv,jv,1))*muv0+rrmu(kv,jv)*(duev0*ety(kv,jv,1)+dvev0*etx(kv,j
2 v,1))
txyv1 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*et
1 x(kv,jv,1))*muv1+duev1*rrmu(kv,jv)*ety(kv,jv,1)
txyv2 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*et
1 x(kv,jv,1))*muv2+dvev2*rrmu(kv,jv)*etx(kv,jv,1)
txydd00 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1 etx(kv,jv,1))*mudd00+2*(duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+d
2 ued0*ety(kv,jv,1)+dved0*etx(kv,jv,1))*mud0+rrmu(kv,jv)*(duzdd00
3 *zty(kv,jv,1)+dvzdd00*ztx(kv,jv,1)+duedd00*ety(kv,jv,1)+dvedd00
4 *etx(kv,jv,1))
txydd01 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*mud0+rrmu(kv,jv)
1 *(duzdd01*zty(kv,jv,1)+duedd01*ety(kv,jv,1))
txydd02 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*mud0+rrmu(kv,jv)
1 *(dvzdd02*ztx(kv,jv,1)+dvedd02*etx(kv,jv,1))
txydd10 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*mud0+rrmu(kv,jv)
1 *(duzdd10*zty(kv,jv,1)+duedd10*ety(kv,jv,1))
txydd20 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*mud0+rrmu(kv,jv)
1 *(dvzdd20*ztx(kv,jv,1)+dvedd20*etx(kv,jv,1))
txydd00 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1 etx(kv,jv,1))*mudd00+2*(duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+d
2 ued0*ety(kv,jv,1)+dved0*etx(kv,jv,1))*mud0+rrmu(kv,jv)*(duzdd00
3 *zty(kv,jv,1)+dvzdd00*ztx(kv,jv,1)+duedd00*ety(kv,jv,1)+dvedd00
4 *etx(kv,jv,1))
txydd01 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*mud0+rrmu(kv,jv)
1 *(duzdd01*zty(kv,jv,1)+duedd01*ety(kv,jv,1))
txydd02 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*mud0+rrmu(kv,jv)
1 *(dvzdd02*ztx(kv,jv,1)+dvedd02*etx(kv,jv,1))
txydd10 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*mud0+rrmu(kv,jv)
1 *(duzdd10*zty(kv,jv,1)+duedd10*ety(kv,jv,1))
txydd20 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*mud0+rrmu(kv,jv)
1 *(dvzdd20*ztx(kv,jv,1)+dvedd20*etx(kv,jv,1))
txydu00 = (duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+dued0*ety(kv,jv,1)
1 )+dved0*etx(kv,jv,1))*muu0+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+d
2 ue*ety(kv,jv,1)+dve*etx(kv,jv,1))*mudu00+(duzu0*zty(kv,jv,1)+dv
3 zu0*ztx(kv,jv,1))*mud0+rrmu(kv,jv)*(duzdu00*zty(kv,jv,1)+dvzdu0
4 0*ztx(kv,jv,1))
txydu01 = (duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+dued0*ety(kv,jv,1)
1 )+dved0*etx(kv,jv,1))*muu1+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+d
2 ue*ety(kv,jv,1)+dve*etx(kv,jv,1))*mudu01+duzul*zty(kv,jv,1)*mud
3 0+duzdu01*rrmu(kv,jv)*zty(kv,jv,1)
txydu02 = (duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+dued0*ety(kv,jv,1)
1 )+dved0*etx(kv,jv,1))*muu2+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+d
2 ue*ety(kv,jv,1)+dve*etx(kv,jv,1))*mudu02+dvzu2*ztx(kv,jv,1)*mud
3 0+dvzdu02*rrmu(kv,jv)*ztx(kv,jv,1)
txydu10 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muu0+duzdu10*rrm
1 u(kv,jv)*zty(kv,jv,1)
txydu11 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muu1
txydu12 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muu2
txydu20 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muu0+dvzdu20*rrm
1 u(kv,jv)*ztx(kv,jv,1)
txydu21 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muu1
txydu22 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muu2
txydv00 = (duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+dued0*ety(kv,jv,1)

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1  )+dved0*etx(kv,jv,1))*muv0+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+d
2  ue*ety(kv,jv,1)+dve*etx(kv,jv,1))*mudv00+(duev0*ety(kv,jv,1)+dv
3  ev0*etx(kv,jv,1))*mud0+rrmu(kv,jv)*(duedv00*ety(kv,jv,1)+dvedv0
4  0*etx(kv,jv,1))
txydv01 = (duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+dued0*ety(kv,jv,1
1  )+dved0*etx(kv,jv,1))*muv1+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+d
2  ue*ety(kv,jv,1)+dve*etx(kv,jv,1))*mudv01+duev1*ety(kv,jv,1)*mud
3  0+duedv01*rrmu(kv,jv)*ety(kv,jv,1)
txydv02 = (duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+dued0*ety(kv,jv,1
1  )+dved0*etx(kv,jv,1))*muv2+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+d
2  ue*ety(kv,jv,1)+dve*etx(kv,jv,1))*mudv02+dvev2*etx(kv,jv,1)*mud
3  0+dvedv02*rrmu(kv,jv)*etx(kv,jv,1)
txydv10 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muv0+duedv10*rrm
1  u(kv,jv)*ety(kv,jv,1)
txydv11 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muv1
txydv12 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muv2
txydv20 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muv0+dvedv20*rrm
1  u(kv,jv)*etx(kv,jv,1)
txydv21 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muv1
txydv22 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muv2
txyud00 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muud00+(duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+due
2  d0*ety(kv,jv,1)+dved0*etx(kv,jv,1))*muu0+(duzu0*zty(kv,jv,1)+dv
3  zu0*ztx(kv,jv,1))*mud0+rrmu(kv,jv)*(duzud00*zty(kv,jv,1)+dvzud0
4  0*ztx(kv,jv,1))
txyud01 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muu0+duzud01*rrm
1  u(kv,jv)*zty(kv,jv,1)
txyud02 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muu0+dvzud02*rrm
1  u(kv,jv)*ztx(kv,jv,1)
txyud10 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muud10+(duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+due
2  d0*ety(kv,jv,1)+dved0*etx(kv,jv,1))*muu1+duzul*zty(kv,jv,1)*mud
3  0+duzud10*rrmu(kv,jv)*zty(kv,jv,1)
txyud11 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muu1
txyud12 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muu1
txyud20 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muud20+(duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+due
2  d0*ety(kv,jv,1)+dved0*etx(kv,jv,1))*muu2+dvzu2*ztx(kv,jv,1)*mud
3  0+dvzud20*rrmu(kv,jv)*ztx(kv,jv,1)
txyud21 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muu2
txyud22 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muu2
txyvd00 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvd00+(duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+due
2  d0*ety(kv,jv,1)+dved0*etx(kv,jv,1))*muv0+(duev0*ety(kv,jv,1)+dv
3  ev0*etx(kv,jv,1))*mud0+rrmu(kv,jv)*(duevd00*ety(kv,jv,1)+dvevd0
4  0*etx(kv,jv,1))
txyvd01 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muv0+duevd01*rrm
1  u(kv,jv)*ety(kv,jv,1)
txyvd02 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muv0+dvevd02*rrm
1  u(kv,jv)*etx(kv,jv,1)
txyvd10 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvd10+(duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+due
2  d0*ety(kv,jv,1)+dved0*etx(kv,jv,1))*muv1+duev1*ety(kv,jv,1)*mud
3  0+duevd10*rrmu(kv,jv)*ety(kv,jv,1)
txyvd11 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muv1
txyvd12 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muv1
txyvd20 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvd20+(duzd0*zty(kv,jv,1)+dvzd0*ztx(kv,jv,1)+due
2  d0*ety(kv,jv,1)+dved0*etx(kv,jv,1))*muv2+dvev2*etx(kv,jv,1)*mud

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3  0+dverd20*rrmu(kv,jv)*etx(kv,jv,1)
txyvd21 = (duzd1*zty(kv,jv,1)+dued1*ety(kv,jv,1))*muv2
txyvd22 = (dvzd2*ztx(kv,jv,1)+dved2*etx(kv,jv,1))*muv2
txyuu00 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muuu00+2*(duzu0*zty(kv,jv,1)+dvzu0*ztx(kv,jv,1))*
2  muu0
txyuu01 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muuu01+(duzu0*zty(kv,jv,1)+dvzu0*ztx(kv,jv,1))*mu
2  u1+duzul*zty(kv,jv,1)*muu0
txyuu02 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muuu02+(duzu0*zty(kv,jv,1)+dvzu0*ztx(kv,jv,1))*mu
2  u2+dvzu2*ztx(kv,jv,1)*muu0
txyuu10 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muuu10+(duzu0*zty(kv,jv,1)+dvzu0*ztx(kv,jv,1))*mu
2  u1+duzul*zty(kv,jv,1)*muu0
txyuu11 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muuu11+2*duzul*zty(kv,jv,1)*muu1
txyuu12 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muuu12+duzul*zty(kv,jv,1)*muu2+dvzu2*ztx(kv,jv,1)
2  *muu1
txyuu20 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muuu20+(duzu0*zty(kv,jv,1)+dvzu0*ztx(kv,jv,1))*mu
2  u2+dvzu2*ztx(kv,jv,1)*muu0
txyuu21 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muuu21+duzul*zty(kv,jv,1)*muu2+dvzu2*ztx(kv,jv,1)
2  *muu1
txyuu22 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muuu22+2*dvzu2*ztx(kv,jv,1)*muu2
txyuv00 = (duzu0*zty(kv,jv,1)+dvzu0*ztx(kv,jv,1))*muv0+(duz*zty(kv
1  ,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*etx(kv,jv,1))*muuv
2  00+(duev0*ety(kv,jv,1)+dvev0*etx(kv,jv,1))*muu0
txyuv01 = (duzu0*zty(kv,jv,1)+dvzu0*ztx(kv,jv,1))*muv1+(duz*zty(kv
1  ,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*etx(kv,jv,1))*muuv
2  01+duev1*ety(kv,jv,1)*muu0
txyuv02 = (duzu0*zty(kv,jv,1)+dvzu0*ztx(kv,jv,1))*muv2+(duz*zty(kv
1  ,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*etx(kv,jv,1))*muuv
2  02+dvev2*etx(kv,jv,1)*muu0
txyuv10 = duzul*zty(kv,jv,1)*muv0+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,
1  1)+due*ety(kv,jv,1)+dve*etx(kv,jv,1))*muuv10+(duev0*ety(kv,jv,1)
2  )+dvev0*etx(kv,jv,1))*muu1
txyuv11 = duzul*zty(kv,jv,1)*muv1+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,
1  1)+due*ety(kv,jv,1)+dve*etx(kv,jv,1))*muuv11+duev1*ety(kv,jv,1)
2  *muu1
txyuv12 = duzul*zty(kv,jv,1)*muv2+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,
1  1)+due*ety(kv,jv,1)+dve*etx(kv,jv,1))*muuv12+dvev2*etx(kv,jv,1)
2  *muu1
txyuv20 = dvzu2*ztx(kv,jv,1)*muv0+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,
1  1)+due*ety(kv,jv,1)+dve*etx(kv,jv,1))*muuv20+(duev0*ety(kv,jv,1)
2  )+dvev0*etx(kv,jv,1))*muu2
txyuv21 = dvzu2*ztx(kv,jv,1)*muv1+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,
1  1)+due*ety(kv,jv,1)+dve*etx(kv,jv,1))*muuv21+duev1*ety(kv,jv,1)
2  *muu2
txyuv22 = dvzu2*ztx(kv,jv,1)*muv2+(duz*zty(kv,jv,1)+dvz*ztx(kv,jv,
1  1)+due*ety(kv,jv,1)+dve*etx(kv,jv,1))*muuv22+dvev2*etx(kv,jv,1)
2  *muu2
txyvu00 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvu00+(duzu0*zty(kv,jv,1)+dvzu0*ztx(kv,jv,1))*mu
2  v0+(duev0*ety(kv,jv,1)+dvev0*etx(kv,jv,1))*muu0
txyvu01 = (duz*zty(kv,jv,1)+dvz*ztx(kv,jv,1)+due*ety(kv,jv,1)+dve*

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1  etx(kv,jv,1))*muvu01+duzul*sty(kv,jv,1)*muv0+(duev0*ety(kv,jv,1
2  )+dvev0*etx(kv,jv,1))*muul
txyvu02 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvu02+dvzu2*stx(kv,jv,1)*muv0+(duev0*ety(kv,jv,1
2  )+dvev0*etx(kv,jv,1))*muu2
txyvu10 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvu10+(duzu0*sty(kv,jv,1)+dvzu0*stx(kv,jv,1))*mu
2  v1+duev1*ety(kv,jv,1))*muu0
txyvu11 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvu11+duzul*sty(kv,jv,1)*muv1+duev1*ety(kv,jv,1)
2  *muul
txyvu12 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvu12+dvzu2*stx(kv,jv,1)*muv1+duev1*ety(kv,jv,1)
2  *muu2
txyvu20 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvu20+(duzu0*sty(kv,jv,1)+dvzu0*stx(kv,jv,1))*mu
2  v2+dvev2*etx(kv,jv,1))*muu0
txyvu21 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvu21+duzul*sty(kv,jv,1)*muv2+dvev2*etx(kv,jv,1)
2  *muul
txyvu22 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvu22+dvzu2*stx(kv,jv,1)*muv2+dvev2*etx(kv,jv,1)
2  *muu2
txyvv00 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvv00+2*(duev0*ety(kv,jv,1)+dvev0*etx(kv,jv,1))*
2  muv0
txyvv01 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvv01+(duev0*ety(kv,jv,1)+dvev0*etx(kv,jv,1))*mu
2  v1+duev1*ety(kv,jv,1))*muv0
txyvv02 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvv02+(duev0*ety(kv,jv,1)+dvev0*etx(kv,jv,1))*mu
2  v2+dvev2*etx(kv,jv,1))*muv0
txyvv10 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvv10+(duev0*ety(kv,jv,1)+dvev0*etx(kv,jv,1))*mu
2  v1+duev1*ety(kv,jv,1))*muv0
txyvv11 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvv11+2*duev1*ety(kv,jv,1)*muv1
txyvv12 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvv12+duev1*ety(kv,jv,1)*muv2+dvev2*etx(kv,jv,1)
2  *muv1
txyvv20 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvv20+(duev0*ety(kv,jv,1)+dvev0*etx(kv,jv,1))*mu
2  v2+dvev2*etx(kv,jv,1))*muv0
txyvv21 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvv21+duev1*ety(kv,jv,1)*muv2+dvev2*etx(kv,jv,1)
2  *muv1
txyvv22 = (duz*sty(kv,jv,1)+dvz*stx(kv,jv,1)+due*ety(kv,jv,1)+dve*
1  etx(kv,jv,1))*muvv22+2*dvev2*etx(kv,jv,1)*muv2

```

tyy:totrds*mu*(2.0*sty*dvz+2.0*ety*dve-ztx*duz-etx*due);

```

tyy = rrmu(kv,jv)*(2.0*dvz*sty(kv,jv,1)-duz*stx(kv,jv,1)+2.0*dve*
1  ty(kv,jv,1)-due*etx(kv,jv,1))*totrds
tyyd0 = (2.0*dvz*sty(kv,jv,1)-duz*stx(kv,jv,1)+2.0*dve*ety(kv,jv,1
1  )-due*etx(kv,jv,1))*mud0*totrds+rrmu(kv,jv)*(2.0*dvzd0*sty(kv,j
2  v,1)-duzd0*stx(kv,jv,1)+2.0*dved0*ety(kv,jv,1)-dued0*etx(kv,jv,
3  1))*totrds
tyyd1 = rrmu(kv,jv)*(-duzd1*stx(kv,jv,1)-dued1*etx(kv,jv,1))*totrd
1  s

```

```

    tyyd2 = rrmu(kv,jv)*(2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1)
1    )*totrds
    tyyu0 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1
1    )-due*etx(kv,jv,1))*muu0*totrds+rrmu(kv,jv)*(2.0*dvzu0*zty(kv,j
2    v,1)-duzu0*ztx(kv,jv,1))*totrds
    tyyu1 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1
1    )-due*etx(kv,jv,1))*muu1*totrds-duzu1*rrmu(kv,jv)*ztx(kv,jv,1)*
2    totrds
    tyyu2 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1
1    )-due*etx(kv,jv,1))*muu2*totrds+2.0*dvzu2*rrmu(kv,jv)*zty(kv,jv
2    ,1)*totrds
    tyyv0 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1
1    )-due*etx(kv,jv,1))*muv0*totrds+rrmu(kv,jv)*(2.0*dvev0*ety(kv,j
2    v,1)-duev0*etx(kv,jv,1))*totrds
    tyyv1 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1
1    )-due*etx(kv,jv,1))*muv1*totrds-duev1*rrmu(kv,jv)*etx(kv,jv,1)*
2    totrds
    tyyv2 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1
1    )-due*etx(kv,jv,1))*muv2*totrds+2.0*dvev2*rrmu(kv,jv)*ety(kv,jv
2    ,1)*totrds
    tyydd00 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1    ,1)-due*etx(kv,jv,1))*mudd00*totrds+2*(2.0*dvzd0*zty(kv,jv,1)-d
2    uzd0*ztx(kv,jv,1)+2.0*dved0*ety(kv,jv,1)-dued0*etx(kv,jv,1))*mu
3    d0*totrds+rrmu(kv,jv)*(2.0*dvzdd00*zty(kv,jv,1)-duzdd00*ztx(kv,
4    jv,1)+2.0*dvedd00*ety(kv,jv,1)-duedd00*etx(kv,jv,1))*totrds
    tyydd01 = (-duzd1*ztx(kv,jv,1)-dued1*etx(kv,jv,1))*mud0*totrds+rrm
1    u(kv,jv)*(-duzdd01*ztx(kv,jv,1)-duedd01*etx(kv,jv,1))*totrds
    tyydd02 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*mud0*tot
1    rds+rrmu(kv,jv)*(2.0*dvzdd02*zty(kv,jv,1)+2.0*dvedd02*ety(kv,jv
2    ,1))*totrds
    tyydd10 = (-duzd1*ztx(kv,jv,1)-dued1*etx(kv,jv,1))*mud0*totrds+rrm
1    u(kv,jv)*(-duzdd10*ztx(kv,jv,1)-duedd10*etx(kv,jv,1))*totrds
    tyydd20 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*mud0*tot
1    rds+rrmu(kv,jv)*(2.0*dvzdd20*zty(kv,jv,1)+2.0*dvedd20*ety(kv,jv
2    ,1))*totrds
    tyydd00 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1    ,1)-due*etx(kv,jv,1))*mudd00*totrds+2*(2.0*dvzd0*zty(kv,jv,1)-d
2    uzd0*ztx(kv,jv,1)+2.0*dved0*ety(kv,jv,1)-dued0*etx(kv,jv,1))*mu
3    d0*totrds+rrmu(kv,jv)*(2.0*dvzdd00*zty(kv,jv,1)-duzdd00*ztx(kv,
4    jv,1)+2.0*dvedd00*ety(kv,jv,1)-duedd00*etx(kv,jv,1))*totrds
    tyydd01 = (-duzd1*ztx(kv,jv,1)-dued1*etx(kv,jv,1))*mud0*totrds+rrm
1    u(kv,jv)*(-duzdd01*ztx(kv,jv,1)-duedd01*etx(kv,jv,1))*totrds
    tyydd02 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*mud0*tot
1    rds+rrmu(kv,jv)*(2.0*dvzdd02*zty(kv,jv,1)+2.0*dvedd02*ety(kv,jv
2    ,1))*totrds
    tyydd10 = (-duzd1*ztx(kv,jv,1)-dued1*etx(kv,jv,1))*mud0*totrds+rrm
1    u(kv,jv)*(-duzdd10*ztx(kv,jv,1)-duedd10*etx(kv,jv,1))*totrds
    tyydd20 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*mud0*tot
1    rds+rrmu(kv,jv)*(2.0*dvzdd20*zty(kv,jv,1)+2.0*dvedd20*ety(kv,jv
2    ,1))*totrds
    tyydu00 = (2.0*dvzd0*zty(kv,jv,1)-duzd0*ztx(kv,jv,1)+2.0*dved0*ety
1    (kv,jv,1)-dued0*etx(kv,jv,1))*muu0*totrds+(2.0*dvz*zty(kv,jv,1)
2    -duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*mudu00
3    *totrds+(2.0*dvzu0*zty(kv,jv,1)-duzu0*ztx(kv,jv,1))*mud0*totrds
4    +rrmu(kv,jv)*(2.0*dvzdu00*zty(kv,jv,1)-duzdu00*ztx(kv,jv,1))*to
5    trds
    tyydu01 = (2.0*dvzd0*zty(kv,jv,1)-duzd0*ztx(kv,jv,1)+2.0*dved0*ety
1    (kv,jv,1)-dued0*etx(kv,jv,1))*muu1*totrds+(2.0*dvz*zty(kv,jv,1)
2    -duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*mudu01

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3  *totrds-duzul*ztx(kv,jv,1)*mud0*totrds-duzdu01*rrmu(kv,jv)*ztx(
4  kv,jv,1)*totrds
  tyydu02 = (2.0*dvzd0*zty(kv,jv,1)-duzd0*ztx(kv,jv,1)+2.0*dved0*ety
1  (kv,jv,1)-dued0*etx(kv,jv,1))*muu2*totrds+(2.0*dvz*zty(kv,jv,1)
2  -duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*mudu02
3  *totrds+2.0*dvzu2*zty(kv,jv,1)*mud0*totrds+2.0*dvzdu02*rrmu(kv,
4  jv)*zty(kv,jv,1)*totrds
  tyydu10 = (-duzdl*ztx(kv,jv,1)-duedl*etx(kv,jv,1))*muu0*totrds-duz
1  dul0*rrmu(kv,jv)*ztx(kv,jv,1)*totrds
  tyydu11 = (-duzdl*ztx(kv,jv,1)-duedl*etx(kv,jv,1))*muu1*totrds
  tyydu12 = (-duzdl*ztx(kv,jv,1)-duedl*etx(kv,jv,1))*muu2*totrds
  tyydu20 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muu0*tot
1  rds+2.0*dvzdu20*rrmu(kv,jv)*zty(kv,jv,1)*totrds
  tyydu21 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muu1*tot
1  rds
  tyydu22 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muu2*tot
1  rds
  tyydv00 = (2.0*dvzd0*zty(kv,jv,1)-duzd0*ztx(kv,jv,1)+2.0*dved0*ety
1  (kv,jv,1)-dued0*etx(kv,jv,1))*muv0*totrds+(2.0*dvz*zty(kv,jv,1)
2  -duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*mudv00
3  *totrds+(2.0*dvev0*ety(kv,jv,1)-duev0*etx(kv,jv,1))*mud0*totrds
4  +rrmu(kv,jv)*(2.0*dvedv00*ety(kv,jv,1)-duedv00*etx(kv,jv,1))*to
5  trds
  tyydv01 = (2.0*dvzd0*zty(kv,jv,1)-duzd0*ztx(kv,jv,1)+2.0*dved0*ety
1  (kv,jv,1)-dued0*etx(kv,jv,1))*muv1*totrds+(2.0*dvz*zty(kv,jv,1)
2  -duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*mudv01
3  *totrds-duev1*etx(kv,jv,1)*mud0*totrds-duedv01*rrmu(kv,jv)*etx(
4  kv,jv,1)*totrds
  tyydv02 = (2.0*dvzd0*zty(kv,jv,1)-duzd0*ztx(kv,jv,1)+2.0*dved0*ety
1  (kv,jv,1)-dued0*etx(kv,jv,1))*muv2*totrds+(2.0*dvz*zty(kv,jv,1)
2  -duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*mudv02
3  *totrds+2.0*dvev2*ety(kv,jv,1)*mud0*totrds+2.0*dvedv02*rrmu(kv,
4  jv)*ety(kv,jv,1)*totrds
  tyydv10 = (-duzdl*ztx(kv,jv,1)-duedl*etx(kv,jv,1))*muv0*totrds-due
1  dv10*rrmu(kv,jv)*etx(kv,jv,1)*totrds
  tyydv11 = (-duzdl*ztx(kv,jv,1)-duedl*etx(kv,jv,1))*muv1*totrds
  tyydv12 = (-duzdl*ztx(kv,jv,1)-duedl*etx(kv,jv,1))*muv2*totrds
  tyydv20 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muv0*tot
1  rds+2.0*dvedv20*rrmu(kv,jv)*ety(kv,jv,1)*totrds
  tyydv21 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muv1*tot
1  rds
  tyydv22 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muv2*tot
1  rds
  tyyud00 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1  ,1)-due*etx(kv,jv,1))*muud00*totrds+(2.0*dvzd0*zty(kv,jv,1)-duz
2  d0*ztx(kv,jv,1)+2.0*dved0*ety(kv,jv,1)-dued0*etx(kv,jv,1))*muu0
3  *totrds+(2.0*dvzu0*zty(kv,jv,1)-duzu0*ztx(kv,jv,1))*mud0*totrds
4  +rrmu(kv,jv)*(2.0*dvzud00*zty(kv,jv,1)-duzud00*ztx(kv,jv,1))*to
5  trds
  tyyud01 = (-duzdl*ztx(kv,jv,1)-duedl*etx(kv,jv,1))*muu0*totrds-duz
1  ud01*rrmu(kv,jv)*ztx(kv,jv,1)*totrds
  tyyud02 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muu0*tot
1  rds+2.0*dvzud02*rrmu(kv,jv)*zty(kv,jv,1)*totrds
  tyyud10 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1  ,1)-due*etx(kv,jv,1))*muud10*totrds+(2.0*dvzd0*zty(kv,jv,1)-duz
2  d0*ztx(kv,jv,1)+2.0*dved0*ety(kv,jv,1)-dued0*etx(kv,jv,1))*muu1
3  *totrds-duzul*ztx(kv,jv,1)*mud0*totrds-duzud10*rrmu(kv,jv)*ztx(
4  kv,jv,1)*totrds
  tyyud11 = (-duzdl*ztx(kv,jv,1)-duedl*etx(kv,jv,1))*muu1*totrds

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tyvud12 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muul*tot
1 rds
yyud20 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muud20*totrds+(2.0*dvzd0*zty(kv,jv,1)-duz
2 d0*ztx(kv,jv,1)+2.0*dved0*ety(kv,jv,1)-dued0*etx(kv,jv,1))*muu2
3 *totrds+2.0*dvzu2*zty(kv,jv,1)*mud0*totrds+2.0*dvzud20*rrmu(kv,
4 jv)*zty(kv,jv,1)*totrds
tyyud21 = (-duzd1*ztx(kv,jv,1)-dued1*etx(kv,jv,1))*muu2*totrds
tyyud22 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muu2*tot
1 rds
tyyvd00 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muvd00*totrds+(2.0*dvzd0*zty(kv,jv,1)-duz
2 d0*ztx(kv,jv,1)+2.0*dved0*ety(kv,jv,1)-dued0*etx(kv,jv,1))*muv0
3 *totrds+(2.0*dvev0*ety(kv,jv,1)-duev0*etx(kv,jv,1))*mud0*totrds
4 +rrmu(kv,jv)*(2.0*dvevd00*ety(kv,jv,1)-duevd00*etx(kv,jv,1))*to
5 trds
tyyvd01 = (-duzd1*ztx(kv,jv,1)-dued1*etx(kv,jv,1))*muv0*totrds-due
1 vd01*rrmu(kv,jv)*etx(kv,jv,1)*totrds
tyyvd02 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muv0*tot
1 rds+2.0*dvevd02*rrmu(kv,jv)*ety(kv,jv,1)*totrds
tyyvd10 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muvd10*totrds+(2.0*dvzd0*zty(kv,jv,1)-duz
2 d0*ztx(kv,jv,1)+2.0*dved0*ety(kv,jv,1)-dued0*etx(kv,jv,1))*muv1
3 *totrds-duev1*etx(kv,jv,1)*mud0*totrds-duevd10*rrmu(kv,jv)*etx(
4 kv,jv,1)*totrds
tyyvd11 = (-duzd1*ztx(kv,jv,1)-dued1*etx(kv,jv,1))*muv1*totrds
tyyvd12 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muv1*tot
1 rds
tyyvd20 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muvd20*totrds+(2.0*dvzd0*zty(kv,jv,1)-duz
2 d0*ztx(kv,jv,1)+2.0*dved0*ety(kv,jv,1)-dued0*etx(kv,jv,1))*muv2
3 *totrds+2.0*dvev2*ety(kv,jv,1)*mud0*totrds+2.0*dvevd20*rrmu(kv,
4 jv)*ety(kv,jv,1)*totrds
tyyvd21 = (-duzd1*ztx(kv,jv,1)-dued1*etx(kv,jv,1))*muv2*totrds
tyyvd22 = (2.0*dvzd2*zty(kv,jv,1)+2.0*dved2*ety(kv,jv,1))*muv2*tot
1 rds
tyyuu00 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muuu00*totrds+2*(2.0*dvzu0*zty(kv,jv,1)-d
2 uzu0*ztx(kv,jv,1))*muu0*totrds
tyyuu01 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muuu01*totrds+(2.0*dvzu0*zty(kv,jv,1)-duz
2 u0*ztx(kv,jv,1))*muul*totrds-duzul*ztx(kv,jv,1)*muu0*totrds
tyyuu02 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muuu02*totrds+(2.0*dvzu0*zty(kv,jv,1)-duz
2 u0*ztx(kv,jv,1))*muu2*totrds+2.0*dvzu2*zty(kv,jv,1)*muu0*totrds
tyyuu10 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muuu10*totrds+(2.0*dvzu0*zty(kv,jv,1)-duz
2 u0*ztx(kv,jv,1))*muul*totrds-duzul*ztx(kv,jv,1)*muu0*totrds
tyyuu11 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muuu11*totrds-2*duzul*ztx(kv,jv,1)*muul*t
2 otrds
tyyuu12 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muuu12*totrds-duzul*ztx(kv,jv,1)*muu2*tot
2 rds+2.0*dvzu2*zty(kv,jv,1)*muul*totrds
tyyuu20 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muuu20*totrds+(2.0*dvzu0*zty(kv,jv,i)-duz
2 u0*ztx(kv,jv,1))*muu2*totrds+2.0*dvzu2*zty(kv,jv,1)*muu0*totrds
tyyuu21 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1 ,1)-due*etx(kv,jv,1))*muuu21*totrds-duzul*ztx(kv,jv,1)*muu2*tot

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2   rds+2.0*dvzu2*zty(kv,jv,1)*muu1*totrds
   tyyuu22 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1   ,1)-due*etx(kv,jv,1))*muu22*totrds+4.0*dvzu2*zty(kv,jv,1)*muu2
2   *totrds
   tyyuv00 = (2.0*dvzu0*zty(kv,jv,1)-duzu0*ztx(kv,jv,1))*muv0*totrds+
1   (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due
2   *etx(kv,jv,1))*muuv00*totrds+(2.0*dvev0*ety(kv,jv,1)-duev0*etx(
3   kv,jv,1))*muu0*totrds
   tyyuv01 = (2.0*dvzu0*zty(kv,jv,1)-duzu0*ztx(kv,jv,1))*muv1*totrds+
1   (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due
2   *etx(kv,jv,1))*muuv01*totrds-duev1*etx(kv,jv,1)*muu0*totrds
   tyyuv02 = (2.0*dvzu0*zty(kv,jv,1)-duzu0*ztx(kv,jv,1))*muv2*totrds+
1   (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due
2   *etx(kv,jv,1))*muuv02*totrds+2.0*dvev2*ety(kv,jv,1)*muu0*totrds
   tyyuv10 = -duzul*ztx(kv,jv,1)*muv0*totrds+(2.0*dvz*zty(kv,jv,1)-du
1   z*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*muuv10*to
2   trds+(2.0*dvev0*ety(kv,jv,1)-duev0*etx(kv,jv,1))*muu1*totrds
   tyyuv11 = -duzul*ztx(kv,jv,1)*muv1*totrds+(2.0*dvz*zty(kv,jv,1)-du
1   z*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*muuv11*to
2   trds-duev1*etx(kv,jv,1)*muu1*totrds
   tyyuv12 = -duzul*ztx(kv,jv,1)*muv2*totrds+(2.0*dvz*zty(kv,jv,1)-du
1   z*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*muuv12*to
2   trds+2.0*dvev2*ety(kv,jv,1)*muu1*totrds
   tyyuv20 = 2.0*dvzu2*zty(kv,jv,1)*muv0*totrds+(2.0*dvz*zty(kv,jv,1)
1   -duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*muuv20
2   *totrds+(2.0*dvev0*ety(kv,jv,1)-duev0*etx(kv,jv,1))*muu2*totrds
   tyyuv21 = 2.0*dvzu2*zty(kv,jv,1)*muv1*totrds+(2.0*dvz*zty(kv,jv,1)
1   -duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*muuv21
2   *totrds-duev1*etx(kv,jv,1)*muu2*totrds
   tyyuv22 = 2.0*dvzu2*zty(kv,jv,1)*muv2*totrds+(2.0*dvz*zty(kv,jv,1)
1   -duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv,1)-due*etx(kv,jv,1))*muuv22
2   *totrds+2.0*dvev2*ety(kv,jv,1)*muu2*totrds
   tyyvu00 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1   ,1)-due*etx(kv,jv,1))*muvu00*totrds+(2.0*dvzu0*zty(kv,jv,1)-duz
2   u0*ztx(kv,jv,1))*muv0*totrds+(2.0*dvev0*ety(kv,jv,1)-duev0*etx(
3   kv,jv,1))*muu0*totrds
   tyyvu01 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1   ,1)-due*etx(kv,jv,1))*muvu01*totrds-duzul*ztx(kv,jv,1)*muv0*tot
2   rds+(2.0*dvev0*ety(kv,jv,1)-duev0*etx(kv,jv,1))*muu1*totrds
   tyyvu02 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1   ,1)-due*etx(kv,jv,1))*muvu02*totrds+2.0*dvzu2*zty(kv,jv,1)*muv0
2   *totrds+(2.0*dvev0*ety(kv,jv,1)-duev0*etx(kv,jv,1))*muu2*totrds
   tyyvu10 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1   ,1)-due*etx(kv,jv,1))*muvu10*totrds+(2.0*dvzu0*zty(kv,jv,1)-duz
2   u0*ztx(kv,jv,1))*muv1*totrds-duev1*etx(kv,jv,1)*muu0*totrds
   tyyvu11 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1   ,1)-due*etx(kv,jv,1))*muvu11*totrds-duzul*ztx(kv,jv,1)*muv1*tot
2   rds-duev1*etx(kv,jv,1)*muu1*totrds
   tyyvu12 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1   ,1)-due*etx(kv,jv,1))*muvu12*totrds+2.0*dvzu2*zty(kv,jv,1)*muv1
2   *totrds-duev1*etx(kv,jv,1)*muu2*totrds
   tyyvu20 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1   ,1)-due*etx(kv,jv,1))*muvu20*totrds+(2.0*dvzu0*zty(kv,jv,1)-duz
2   u0*ztx(kv,jv,1))*muv2*totrds+2.0*dvev2*ety(kv,jv,1)*muu0*totrds
   tyyvu21 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1   ,1)-due*etx(kv,jv,1))*muvu21*totrds-duzul*ztx(kv,jv,1)*muv2*tot
2   rds+2.0*dvev2*ety(kv,jv,1)*muu1*totrds
   tyyvu22 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1   ,1)-due*etx(kv,jv,1))*muvu22*totrds+2.0*dvzu2*zty(kv,jv,1)*muv2

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2      *totrds+2.0*dvev2*ety(kv,jv,1)*muu2*totrds
tyyvv00 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1      ,1)-due*etx(kv,jv,1))*muvv00*totrds+2*(2.0*dvev0*ety(kv,jv,1)-d
2      uev0*etx(kv,jv,1))*muv0*totrds
tyyvv01 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1      ,1)-due*etx(kv,jv,1))*muvv01*totrds+(2.0*dvev0*ety(kv,jv,1)-due
2      v0*etx(kv,jv,1))*muv1*totrds-duev1*etx(kv,jv,1)*muv0*totrds
tyyvv02 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1      ,1)-due*etx(kv,jv,1))*muvv02*totrds+(2.0*dvev0*ety(kv,jv,1)-due
2      v0*etx(kv,jv,1))*muv2*totrds+2.0*dvev2*ety(kv,jv,1)*muv0*totrds
tyyvv10 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1      ,1)-due*etx(kv,jv,1))*muvv10*totrds+(2.0*dvev0*ety(kv,jv,1)-due
2      v0*etx(kv,jv,1))*muv1*totrds-duev1*etx(kv,jv,1)*muv0*totrds
tyyvv11 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1      ,1)-due*etx(kv,jv,1))*muvv11*totrds-2*duev1*etx(kv,jv,1)*muv1*t
2      otrds
tyyvv12 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1      ,1)-due*etx(kv,jv,1))*muvv12*totrds-duev1*etx(kv,jv,1)*muv2*tot
2      rds+2.0*dvev2*ety(kv,jv,1)*muv1*totrds
tyyvv20 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1      ,1)-due*etx(kv,jv,1))*muvv20*totrds+(2.0*dvev0*ety(kv,jv,1)-due
2      v0*etx(kv,jv,1))*muv2*totrds+2.0*dvev2*ety(kv,jv,1)*muv0*totrds
tyyvv21 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1      ,1)-due*etx(kv,jv,1))*muvv21*totrds-duev1*etx(kv,jv,1)*muv2*tot
2      rds+2.0*dvev2*ety(kv,jv,1)*muv1*totrds
tyyvv22 = (2.0*dvz*zty(kv,jv,1)-duz*ztx(kv,jv,1)+2.0*dve*ety(kv,jv
1      ,1)-due*etx(kv,jv,1))*muvv22*totrds+4.0*dvev2*ety(kv,jv,1)*muv2
2      *totrds

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bx:gam*mu/pr*(ztx*dez+etx*dee)+m/r*txx+n/r*txy

by:gam*mu/pr*(zty*dez+ety*dee)+m/r*txy+n/r*tyy

```
bx = rrmu(kv,jv)*(dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*gamma/pr+rhov
1 (kv,jv,1)*txy/rho(kv,jv,1)+rhov(kv,jv,1)*txx/rho(kv,jv,1)
bxd0 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*mud0*gamma/pr+rrmu(kv,j
1 v)*(dez*d0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*gamma/pr+rhov(kv,jv,
2 1)*txyd0/rho(kv,jv,1)-rhov(kv,jv,1)*txy/rho(kv,jv,1)**2+rhov(kv
3 ,jv,1)*txxd0/rho(kv,jv,1)-rhov(kv,jv,1)*txx/rho(kv,jv,1)**2
bxd1 = rrmu(kv,jv)*(dez*d1*ztx(kv,jv,1)+deed1*etx(kv,jv,1))*gamma/p
1 r+rhov(kv,jv,1)*txyd1/rho(kv,jv,1)+rhov(kv,jv,1)*txxd1/rho(kv,j
2 v,1)+txx/rho(kv,jv,1)
bxd2 = rrmu(kv,jv)*(dez*d2*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*gamma/p
1 r+rhov(kv,jv,1)*txyd2/rho(kv,jv,1)+txy/rho(kv,jv,1)+rhov(kv,jv,
2 1)*txxd2/rho(kv,jv,1)
bxd3 = rrmu(kv,jv)*(dez*d3*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*gamma/p
1 r
bxu0 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muu0*gamma/pr+dezu0*rrm
1 u(kv,jv)*ztx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyu0/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txxu0/rho(kv,jv,1)
bxu1 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muu1*gamma/pr+dezu1*rrm
1 u(kv,jv)*ztx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyu1/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txxu1/rho(kv,jv,1)
bxu2 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muu2*gamma/pr+dezu2*rrm
1 u(kv,jv)*ztx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyu2/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txxu2/rho(kv,jv,1)
bxu3 = dezu3*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr
bxv0 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muv0*gamma/pr+deev0*rrm
1 u(kv,jv)*etx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyv0/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txxv0/rho(kv,jv,1)
bxv1 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muv1*gamma/pr+deev1*rrm
1 u(kv,jv)*etx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyv1/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txxv1/rho(kv,jv,1)
bxv2 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muv2*gamma/pr+deev2*rrm
1 u(kv,jv)*etx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyv2/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txxv2/rho(kv,jv,1)
bxv3 = deev3*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr
bxdd00 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*mudd00*gamma/pr+2*(de
1 zd0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*mud0*gamma/pr+rrmu(kv,jv)*
2 (dezdd00*ztx(kv,jv,1)+deedd00*etx(kv,jv,1))*gamma/pr+rhov(kv,jv
3 ,1)*txydd00/rho(kv,jv,1)-2*rhov(kv,jv,1)*txyd0/rho(kv,jv,1)**2+
4 2*rhov(kv,jv,1)*txy/rho(kv,jv,1)**3+rhov(kv,jv,1)*txxdd00/rho(k
5 v,jv,1)-2*rhov(kv,jv,1)*txxd0/rho(kv,jv,1)**2+2*rhov(kv,jv,1)*t
6 xx/rho(kv,jv,1)**3
bxdd01 = (dez*d1*ztx(kv,jv,1)+deed1*etx(kv,jv,1))*mud0*gamma/pr+rrm
1 u(kv,jv)*(dezdd01*ztx(kv,jv,1)+deedd01*etx(kv,jv,1))*gamma/pr+r
2 hov(kv,jv,1)*txydd01/rho(kv,jv,1)-rhov(kv,jv,1)*txyd1/rho(kv,jv
3 ,1)**2+rhov(kv,jv,1)*txxdd01/rho(kv,jv,1)-rhov(kv,jv,1)*txxd1/r
4 ho(kv,jv,1)**2+txxd0/rho(kv,jv,1)-txx/rho(kv,jv,1)**2
bxdd02 = (dez*d2*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*mud0*gamma/pr+rrm
1 u(kv,jv)*(dezdd02*ztx(kv,jv,1)+deedd02*etx(kv,jv,1))*gamma/pr+r
2 hov(kv,jv,1)*txydd02/rho(kv,jv,1)-rhov(kv,jv,1)*txyd2/rho(kv,jv
3 ,1)**2+txyd0/rho(kv,jv,1)-txy/rho(kv,jv,1)**2+rhov(kv,jv,1)*txx
4 dd02/rho(kv,jv,1)-rhov(kv,jv,1)*txxd2/rho(kv,jv,1)**2
bxdd03 = (dez*d3*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*mud0*gamma/pr+rrm
1 u(kv,jv)*(dezdd03*ztx(kv,jv,1)+deedd03*etx(kv,jv,1))*gamma/pr
bxdd10 = (dez*d1*ztx(kv,jv,1)+deed1*etx(kv,jv,1))*mud0*gamma/pr+rrm
1 u(kv,jv)*(dezdd10*ztx(kv,jv,1)+deedd10*etx(kv,jv,1))*gamma/pr+r
```

```

2  hov(kv,jv,1)*txydd10/rho(kv,jv,1)-rhov(kv,jv,1)*txyd1/rho(kv,jv
3  ,1)**2+rhov(kv,jv,1)*txxdd10/rho(kv,jv,1)-rhov(kv,jv,1)*txxd1/r
4  ho(kv,jv,1)**2+txxd0/rho(kv,jv,1)-txx/rho(kv,jv,1)**2
  bxddd11 = rrmu(kv,jv)*(dezdd11*ztx(kv,jv,1)+deedd11*etx(kv,jv,1))*g
1  amma/pr+2*txxd1/rho(kv,jv,1)
  bxddd12 = txyd1/rho(kv,jv,1)+txxd2/rho(kv,jv,1)
  bxddd20 = (dezdd2*ztx(kv,jv,1)+deedd2*etx(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd20*ztx(kv,jv,1)+deedd20*etx(kv,jv,1))*gamma/pr+r
2  hov(kv,jv,1)*txydd20/rho(kv,jv,1)-rhov(kv,jv,1)*txyd2/rho(kv,jv
3  ,1)**2+txyd0/rho(kv,jv,1)-txy/rho(kv,jv,1)**2+rhov(kv,jv,1)*txx
4  dd20/rho(kv,jv,1)-rhov(kv,jv,1)*txxd2/rho(kv,jv,1)**2
  bxddd21 = txyd1/rho(kv,jv,1)+txxd2/rho(kv,jv,1)
  bxddd22 = rrmu(kv,jv)*(dezdd22*ztx(kv,jv,1)+deedd22*etx(kv,jv,1))*g
1  amma/pr+2*txyd2/rho(kv,jv,1)
  bxddd30 = (dezdd3*ztx(kv,jv,1)+deedd3*etx(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd30*ztx(kv,jv,1)+deedd30*etx(kv,jv,1))*gamma/pr
  bxddd00 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*mudd00*gamma/pr+2*(de
1  zd0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*mud0*gamma/pr+rrmu(kv,jv)*
2  (dezdd00*ztx(kv,jv,1)+deedd00*etx(kv,jv,1))*gamma/pr+rhov(kv,jv
3  ,1)*txydd00/rho(kv,jv,1)-2*rhov(kv,jv,1)*txyd0/rho(kv,jv,1)**2+
4  2*rhov(kv,jv,1)*txy/rho(kv,jv,1)**3+rhov(kv,jv,1)*txxdd00/rho(k
5  v,jv,1)-2*rhov(kv,jv,1)*txxd0/rho(kv,jv,1)**2+2*rhov(kv,jv,1)*t
6  xx/rho(kv,jv,1)**3
  bxddd01 = (dezdd1*ztx(kv,jv,1)+deedd1*etx(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd01*ztx(kv,jv,1)+deedd01*etx(kv,jv,1))*gamma/pr+r
2  hov(kv,jv,1)*txydd01/rho(kv,jv,1)-rhov(kv,jv,1)*txyd1/rho(kv,jv
3  ,1)**2+rhov(kv,jv,1)*txxdd01/rho(kv,jv,1)-rhov(kv,jv,1)*txxd1/r
4  ho(kv,jv,1)**2+txxd0/rho(kv,jv,1)-txx/rho(kv,jv,1)**2
  bxddd02 = (dezdd2*ztx(kv,jv,1)+deedd2*etx(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd02*ztx(kv,jv,1)+deedd02*etx(kv,jv,1))*gamma/pr+r
2  hov(kv,jv,1)*txydd02/rho(kv,jv,1)-rhov(kv,jv,1)*txyd2/rho(kv,jv
3  ,1)**2+txyd0/rho(kv,jv,1)-txy/rho(kv,jv,1)**2+rhov(kv,jv,1)*txx
4  dd02/rho(kv,jv,1)-rhov(kv,jv,1)*txxd2/rho(kv,jv,1)**2
  bxddd03 = (dezdd3*ztx(kv,jv,1)+deedd3*etx(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd03*ztx(kv,jv,1)+deedd03*etx(kv,jv,1))*gamma/pr
  bxddd10 = (dezdd1*ztx(kv,jv,1)+deedd1*etx(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd10*ztx(kv,jv,1)+deedd10*etx(kv,jv,1))*gamma/pr+r
2  hov(kv,jv,1)*txydd10/rho(kv,jv,1)-rhov(kv,jv,1)*txyd1/rho(kv,jv
3  ,1)**2+rhov(kv,jv,1)*txxdd10/rho(kv,jv,1)-rhov(kv,jv,1)*txxd1/r
4  ho(kv,jv,1)**2+txxd0/rho(kv,jv,1)-txx/rho(kv,jv,1)**2
  bxddd11 = rrmu(kv,jv)*(dezdd11*ztx(kv,jv,1)+deedd11*etx(kv,jv,1))*g
1  amma/pr+2*txxd1/rho(kv,jv,1)
  bxddd12 = txyd1/rho(kv,jv,1)+txxd2/rho(kv,jv,1)
  bxddd20 = (dezdd2*ztx(kv,jv,1)+deedd2*etx(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd20*ztx(kv,jv,1)+deedd20*etx(kv,jv,1))*gamma/pr+r
2  hov(kv,jv,1)*txydd20/rho(kv,jv,1)-rhov(kv,jv,1)*txyd2/rho(kv,jv
3  ,1)**2+txyd0/rho(kv,jv,1)-txy/rho(kv,jv,1)**2+rhov(kv,jv,1)*txx
4  dd20/rho(kv,jv,1)-rhov(kv,jv,1)*txxd2/rho(kv,jv,1)**2
  bxddd21 = txyd1/rho(kv,jv,1)+txxd2/rho(kv,jv,1)
  bxddd22 = rrmu(kv,jv)*(dezdd22*ztx(kv,jv,1)+deedd22*etx(kv,jv,1))*g
1  amma/pr+2*txyd2/rho(kv,jv,1)
  bxddd30 = (dezdd3*ztx(kv,jv,1)+deedd3*etx(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd30*ztx(kv,jv,1)+deedd30*etx(kv,jv,1))*gamma/pr
  bxdu00 = (dezdd0*ztx(kv,jv,1)+deedd0*etx(kv,jv,1))*muu0*gamma/pr+(de
1  z*ztx(kv,jv,1)+dee*etx(kv,jv,1))*mudu00*gamma/pr+dezu0*ztx(kv,j
2  v,1)*mud0*gamma/pr+dezu00*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*txyu0/rho(kv,jv,1)**2+rhov(kv,jv,1)*txydu00/rho(kv,
4  jv,1)-rhov(kv,jv,1)*txxu0/rho(kv,jv,1)**2+rhov(kv,jv,1)*txxdu00
5  /rho(kv,jv,1)

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bxdu01 = (dezd0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*muu1*gamma/pr+(de
1  z*ztx(kv,jv,1)+dee*etx(kv,jv,1))*mudu01*gamma/pr+dezu1*ztx(kv,j
2  v,1)*mud0*gamma/pr+dezdu01*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*txyu1/rho(kv,jv,1)**2+rhov(kv,jv,1)*txydu01/rho(kv,
4  jv,1)-rhov(kv,jv,1)*txxu1/rho(kv,jv,1)**2+rhov(kv,jv,1)*txxdu01
5  /rho(kv,jv,1)
bxdu02 = (dezd0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*muu2*gamma/pr+(de
1  z*ztx(kv,jv,1)+dee*etx(kv,jv,1))*mudu02*gamma/pr+dezu2*ztx(kv,j
2  v,1)*mud0*gamma/pr+dezdu02*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*txyu2/rho(kv,jv,1)**2+rhov(kv,jv,1)*txydu02/rho(kv,
4  jv,1)-rhov(kv,jv,1)*txxu2/rho(kv,jv,1)**2+rhov(kv,jv,1)*txxdu02
5  /rho(kv,jv,1)
bxdu03 = dezu3*ztx(kv,jv,1)*mud0*gamma/pr+dezdu03*rrmu(kv,jv)*ztx(
1  kv,jv,1)*gamma/pr
bxdu10 = (dezd1*ztx(kv,jv,1)+deed1*etx(kv,jv,1))*muu0*gamma/pr+dez
1  du10*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txydu10/rh
2  o(kv,jv,1)+txxu0/rho(kv,jv,1)+rhov(kv,jv,1)*txxdu10/rho(kv,jv,1
3  )
bxdu11 = (dezd1*ztx(kv,jv,1)+deed1*etx(kv,jv,1))*muu1*gamma/pr+dez
1  du11*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txydu11/rh
2  o(kv,jv,1)+txxu1/rho(kv,jv,1)+rhov(kv,jv,1)*txxdu11/rho(kv,jv,1
3  )
bxdu12 = (dezd1*ztx(kv,jv,1)+deed1*etx(kv,jv,1))*muu2*gamma/pr+rho
1  v(kv,jv,1)*txydu12/rho(kv,jv,1)+txxu2/rho(kv,jv,1)+rhov(kv,jv,1)
2  )*txxdu12/rho(kv,jv,1)
bxdu20 = (dezd2*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muu0*gamma/pr+dez
1  du20*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr+txyu0/rho(kv,jv,1)+rhov(
2  kv,jv,1)*txydu20/rho(kv,jv,1)+rhov(kv,jv,1)*txxdu20/rho(kv,jv,1
3  )
bxdu21 = (dezd2*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muu1*gamma/pr+txy
1  u1/rho(kv,jv,1)+rhov(kv,jv,1)*txydu21/rho(kv,jv,1)+rhov(kv,jv,1)
2  )*txxdu21/rho(kv,jv,1)
bxdu22 = (dezd2*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muu2*gamma/pr+dez
1  du22*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr+txyu2/rho(kv,jv,1)+rhov(
2  kv,jv,1)*txydu22/rho(kv,jv,1)+rhov(kv,jv,1)*txxdu22/rho(kv,jv,1
3  )
bxdu30 = (dezd3*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muu0*gamma/pr+dez
1  du30*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr
bxdu31 = (dezd3*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muu1*gamma/pr
bxdu32 = (dezd3*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muu2*gamma/pr
bxdu00 = (dezd0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*muv0*gamma/pr+(de
1  z*ztx(kv,jv,1)+dee*etx(kv,jv,1))*mudv00*gamma/pr+deev0*etx(kv,j
2  v,1)*mud0*gamma/pr+deedv00*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*txyv0/rho(kv,jv,1)**2+rhov(kv,jv,1)*txydv00/rho(kv,
4  jv,1)-rhov(kv,jv,1)*txxv0/rho(kv,jv,1)**2+rhov(kv,jv,1)*txxdv00
5  /rho(kv,jv,1)
bxdu01 = (dezd0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*muv1*gamma/pr+(de
1  z*ztx(kv,jv,1)+dee*etx(kv,jv,1))*mudv01*gamma/pr+deev1*etx(kv,j
2  v,1)*mud0*gamma/pr+deedv01*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*txyv1/rho(kv,jv,1)**2+rhov(kv,jv,1)*txydv01/rho(kv,
4  jv,1)-rhov(kv,jv,1)*txxv1/rho(kv,jv,1)**2+rhov(kv,jv,1)*txxdv01
5  /rho(kv,jv,1)
bxdu02 = (dezd0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*muv2*gamma/pr+(de
1  z*ztx(kv,jv,1)+dee*etx(kv,jv,1))*mudv02*gamma/pr+deev2*etx(kv,j
2  v,1)*mud0*gamma/pr+deedv02*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*txyv2/rho(kv,jv,1)**2+rhov(kv,jv,1)*txydv02/rho(kv,
4  jv,1)-rhov(kv,jv,1)*txxv2/rho(kv,jv,1)**2+rhov(kv,jv,1)*txxdv02
5  /rho(kv,jv,1)
bxdu03 = deev3*etx(kv,jv,1)*mud0*gamma/pr+deedv03*rrmu(kv,jv)*etx(

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1 kv,jv,1)*gamma/pr
  bxdv10 = (dezdl*ztx(kv,jv,1)+deed1*etx(kv,jv,1))*muv0*gamma/pr+dee
1 dv10*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txydv10/rh
2 o(kv,jv,1)+txxv0/rho(kv,jv,1)+rhov(kv,jv,1)*txxdv10/rho(kv,jv,1
3 )
  bxdv11 = (dezdl*ztx(kv,jv,1)+deed1*etx(kv,jv,1))*muv1*gamma/pr+dee
1 dv11*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txydv11/rh
2 o(kv,jv,1)+txxv1/rho(kv,jv,1)+rhov(kv,jv,1)*txxdv11/rho(kv,jv,1
3 )
  bxdv12 = (dezdl*ztx(kv,jv,1)+deed1*etx(kv,jv,1))*muv2*gamma/pr+rho
1 v(kv,jv,1)*txydv12/rho(kv,jv,1)+txxv2/rho(kv,jv,1)+rhov(kv,jv,1
2 )*txxdv12/rho(kv,jv,1)
  bxdv20 = (dezdl*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muv0*gamma/pr+dee
1 dv20*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr+txyv0/rho(kv,jv,1)+rhov(
2 kv,jv,1)*txydv20/rho(kv,jv,1)+rhov(kv,jv,1)*txxdv20/rho(kv,jv,1
3 )
  bxdv21 = (dezdl*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muv1*gamma/pr+txy
1 v1/rho(kv,jv,1)+rhov(kv,jv,1)*txydv21/rho(kv,jv,1)+rhov(kv,jv,1
2 )*txxdv21/rho(kv,jv,1)
  bxdv22 = (dezdl*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muv2*gamma/pr+dee
1 dv22*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr+txyv2/rho(kv,jv,1)+rhov(
2 kv,jv,1)*txydv22/rho(kv,jv,1)+rhov(kv,jv,1)*txxdv22/rho(kv,jv,1
3 )
  bxdv30 = (dezdl*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muv0*gamma/pr+dee
1 dv30*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr
  bxdv31 = (dezdl*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muv1*gamma/pr
  bxdv32 = (dezdl*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muv2*gamma/pr
  bxud00 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muud00*gamma/pr+(dez
1 0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*muu0*gamma/pr+dezu0*ztx(kv,j
2 v,1)*mud0*gamma/pr+dezud00*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr+rh
3 ov(kv,jv,1)*txyud00/rho(kv,jv,1)-rhov(kv,jv,1)*txyu0/rho(kv,jv,
4 1)**2+rhov(kv,jv,1)*txxud00/rho(kv,jv,1)-rhov(kv,jv,1)*txxu0/rh
5 o(kv,jv,1)**2
  bxud01 = (dezdl*ztx(kv,jv,1)+deed1*etx(kv,jv,1))*muu0*gamma/pr+dez
1 ud01*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyud01/rh
2 o(kv,jv,1)+rhov(kv,jv,1)*txxud01/rho(kv,jv,1)+txxu0/rho(kv,jv,1
3 )
  bxud02 = (dezdl*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muu0*gamma/pr+dez
1 ud02*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyud02/rh
2 o(kv,jv,1)+txyu0/rho(kv,jv,1)+rhov(kv,jv,1)*txxud02/rho(kv,jv,1
3 )
  bxud03 = (dezdl*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muu0*gamma/pr+dez
1 ud03*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr
  bxud10 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muud10*gamma/pr+(dez
1 0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*muul*gamma/pr+dezu1*ztx(kv,j
2 v,1)*mud0*gamma/pr+dezud10*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr+rh
3 ov(kv,jv,1)*txyud10/rho(kv,jv,1)-rhov(kv,jv,1)*txyu1/rho(kv,jv,
4 1)**2+rhov(kv,jv,1)*txxud10/rho(kv,jv,1)-rhov(kv,jv,1)*txxu1/rh
5 o(kv,jv,1)**2
  bxud11 = (dezdl*ztx(kv,jv,1)+deed1*etx(kv,jv,1))*muul*gamma/pr+dez
1 ud11*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyud11/rh
2 o(kv,jv,1)+rhov(kv,jv,1)*txxud11/rho(kv,jv,1)+txxu1/rho(kv,jv,1
3 )
  bxud12 = (dezdl*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muul*gamma/pr+rho
1 v(kv,jv,1)*txyud12/rho(kv,jv,1)+txyu1/rho(kv,jv,1)+rhov(kv,jv,1
2 )*txxud12/rho(kv,jv,1)
  bxud13 = (dezdl*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muul*gamma/pr
  bxud20 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muud20*gamma/pr+(dez
1 0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*muu2*gamma/pr+dezu2*ztx(kv,j

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2  v,1)*mud0*gamma/pr+dezud20*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr+rh
3  ov(kv,jv,1)*txyud20/rho(kv,jv,1)-rhov(kv,jv,1)*txyu2/rho(kv,jv,
4  1)**2+rhou(kv,jv,1)*txxud20/rho(kv,jv,1)-rhou(kv,jv,1)*txxu2/rh
5  o(kv,jv,1)**2
  bxud21 = (dezdl*ztx(kv,jv,1)+deedl*etx(kv,jv,1))*muu2*gamma/pr+rho
1  v(kv,jv,1)*txyud21/rho(kv,jv,1)+rhou(kv,jv,1)*txxud21/rho(kv,jv
2  ,1)+txxu2/rho(kv,jv,1)
  bxud22 = (dezdl*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muu2*gamma/pr+dez
1  ud22*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyud22/rh
2  o(kv,jv,1)+txyu2/rho(kv,jv,1)+rhou(kv,jv,1)*txxud22/rho(kv,jv,1
3  )
  bxud23 = (dezdl*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muu2*gamma/pr
  bxud30 = dezu3*ztx(kv,jv,1)*mud0*gamma/pr+dezud30*rrmu(kv,jv)*ztx(
1  kv,jv,1)*gamma/pr
  bxvd00 = (dezdl*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvd00*gamma/pr+(dez
1  0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*muv0*gamma/pr+deev0*etx(kv,j
2  v,1)*mud0*gamma/pr+deevd00*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr+rh
3  ov(kv,jv,1)*txyv00/rho(kv,jv,1)-rhov(kv,jv,1)*txyv0/rho(kv,jv,
4  1)**2+rhou(kv,jv,1)*txxvd00/rho(kv,jv,1)-rhou(kv,jv,1)*txxv0/rh
5  o(kv,jv,1)**2
  bxvd01 = (dezdl*ztx(kv,jv,1)+deedl*etx(kv,jv,1))*muv0*gamma/pr+dee
1  vd01*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyv01/rh
2  o(kv,jv,1)+rhou(kv,jv,1)*txxvd01/rho(kv,jv,1)+txxv0/rho(kv,jv,1
3  )
  bxvd02 = (dezdl*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muv0*gamma/pr+dee
1  vd02*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyv02/rh
2  o(kv,jv,1)+txyv0/rho(kv,jv,1)+rhou(kv,jv,1)*txxvd02/rho(kv,jv,1
3  )
  bxvd03 = (dezdl*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muv0*gamma/pr+dee
1  vd03*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr
  bxvd10 = (dezdl*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvd10*gamma/pr+(dez
1  0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*muv1*gamma/pr+deev1*etx(kv,j
2  v,1)*mud0*gamma/pr+deevd10*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr+rh
3  ov(kv,jv,1)*txyv10/rho(kv,jv,1)-rhov(kv,jv,1)*txyv1/rho(kv,jv,
4  1)**2+rhou(kv,jv,1)*txxvd10/rho(kv,jv,1)-rhou(kv,jv,1)*txxv1/rh
5  o(kv,jv,1)**2
  bxvd11 = (dezdl*ztx(kv,jv,1)+deedl*etx(kv,jv,1))*muv1*gamma/pr+dee
1  vd11*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyv11/rh
2  o(kv,jv,1)+rhou(kv,jv,1)*txxvd11/rho(kv,jv,1)+txxv1/rho(kv,jv,1
3  )
  bxvd12 = (dezdl*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muv1*gamma/pr+rho
1  v(kv,jv,1)*txyv12/rho(kv,jv,1)+txyv1/rho(kv,jv,1)+rhou(kv,jv,1)
2  )*txxvd12/rho(kv,jv,1)
  bxvd13 = (dezdl*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muv1*gamma/pr
  bxvd20 = (dezdl*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvd20*gamma/pr+(dez
1  0*ztx(kv,jv,1)+deed0*etx(kv,jv,1))*muv2*gamma/pr+deev2*etx(kv,j
2  v,1)*mud0*gamma/pr+deevd20*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr+rh
3  ov(kv,jv,1)*txyv20/rho(kv,jv,1)-rhov(kv,jv,1)*txyv2/rho(kv,jv,
4  1)**2+rhou(kv,jv,1)*txxvd20/rho(kv,jv,1)-rhou(kv,jv,1)*txxv2/rh
5  o(kv,jv,1)**2
  bxvd21 = (dezdl*ztx(kv,jv,1)+deedl*etx(kv,jv,1))*muv2*gamma/pr+rho
1  v(kv,jv,1)*txyv21/rho(kv,jv,1)+rhou(kv,jv,1)*txxvd21/rho(kv,jv
2  ,1)+txxv2/rho(kv,jv,1)
  bxvd22 = (dezdl*ztx(kv,jv,1)+deed2*etx(kv,jv,1))*muv2*gamma/pr+dee
1  vd22*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*txyv22/rh
2  o(kv,jv,1)+txyv2/rho(kv,jv,1)+rhou(kv,jv,1)*txxvd22/rho(kv,jv,1
3  )
  bxvd23 = (dezdl*ztx(kv,jv,1)+deed3*etx(kv,jv,1))*muv2*gamma/pr
  bxvd30 = deev3*etx(kv,jv,1)*mud0*gamma/pr+deevd30*rrmu(kv,jv)*etx(

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1 kv,jv,1)*gamma/pr
bxuu00 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muuu00*gamma/pr+2*dez
1 u0*ztx(kv,jv,1)*muu0*gamma/pr+rhov(kv,jv,1)*txyuu00/rho(kv,jv,1
2 )+rhov(kv,jv,1)*txxuu00/rho(kv,jv,1)
bxuu01 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muuu01*gamma/pr+dezu0
1 *ztx(kv,jv,1)*muu1*gamma/pr+dezu1*ztx(kv,jv,1)*muu0*gamma/pr+rh
2 ov(kv,jv,1)*txyuu01/rho(kv,jv,1)+rhov(kv,jv,1)*txxuu01/rho(kv,j
3 v,1)
bxuu02 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muuu02*gamma/pr+dezu0
1 *ztx(kv,jv,1)*muu2*gamma/pr+dezu2*ztx(kv,jv,1)*muu0*gamma/pr+rh
2 ov(kv,jv,1)*txyuu02/rho(kv,jv,1)+rhov(kv,jv,1)*txxuu02/rho(kv,j
3 v,1)
bxuu03 = dezu3*ztx(kv,jv,1)*muu0*gamma/pr
bxuu10 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muuu10*gamma/pr+dezu0
1 *ztx(kv,jv,1)*muu1*gamma/pr+dezu1*ztx(kv,jv,1)*muu0*gamma/pr+rh
2 ov(kv,jv,1)*txyuu10/rho(kv,jv,1)+rhov(kv,jv,1)*txxuu10/rho(kv,j
3 v,1)
bxuu11 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muuu11*gamma/pr+2*dez
1 u1*ztx(kv,jv,1)*muu1*gamma/pr+rhov(kv,jv,1)*txyuu11/rho(kv,jv,1
2 )+rhov(kv,jv,1)*txxuu11/rho(kv,jv,1)
bxuu12 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muuu12*gamma/pr+dezu1
1 *ztx(kv,jv,1)*muu2*gamma/pr+dezu2*ztx(kv,jv,1)*muu1*gamma/pr+rh
2 ov(kv,jv,1)*txyuu12/rho(kv,jv,1)+rhov(kv,jv,1)*txxuu12/rho(kv,j
3 v,1)
bxuu13 = dezu3*ztx(kv,jv,1)*muu1*gamma/pr
bxuu20 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muuu20*gamma/pr+dezu0
1 *ztx(kv,jv,1)*muu2*gamma/pr+dezu2*ztx(kv,jv,1)*muu0*gamma/pr+rh
2 ov(kv,jv,1)*txyuu20/rho(kv,jv,1)+rhov(kv,jv,1)*txxuu20/rho(kv,j
3 v,1)
bxuu21 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muuu21*gamma/pr+dezu1
1 *ztx(kv,jv,1)*muu2*gamma/pr+dezu2*ztx(kv,jv,1)*muu1*gamma/pr+rh
2 ov(kv,jv,1)*txyuu21/rho(kv,jv,1)+rhov(kv,jv,1)*txxuu21/rho(kv,j
3 v,1)
bxuu22 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muuu22*gamma/pr+2*dez
1 u2*ztx(kv,jv,1)*muu2*gamma/pr+rhov(kv,jv,1)*txyuu22/rho(kv,jv,1
2 )+rhov(kv,jv,1)*txxuu22/rho(kv,jv,1)
bxuu23 = dezu3*ztx(kv,jv,1)*muu2*gamma/pr
bxuu30 = dezu3*ztx(kv,jv,1)*muu0*gamma/pr
bxuu31 = dezu3*ztx(kv,jv,1)*muu1*gamma/pr
bxuu32 = dezu3*ztx(kv,jv,1)*muu2*gamma/pr
bxuv00 = dezu0*ztx(kv,jv,1)*muuv0*gamma/pr+(dez*ztx(kv,jv,1)+dee*et
1 x(kv,jv,1))*muuv00*gamma/pr+deev0*etx(kv,jv,1)*muu0*gamma/pr+rh
2 ov(kv,jv,1)*txyuv00/rho(kv,jv,1)+rhov(kv,jv,1)*txxuv00/rho(kv,j
3 v,1)
bxuv01 = dezu0*ztx(kv,jv,1)*muuv1*gamma/pr+(dez*ztx(kv,jv,1)+dee*et
1 x(kv,jv,1))*muuv01*gamma/pr+deev1*etx(kv,jv,1)*muu0*gamma/pr+rh
2 ov(kv,jv,1)*txyuv01/rho(kv,jv,1)+rhov(kv,jv,1)*txxuv01/rho(kv,j
3 v,1)
bxuv02 = dezu0*ztx(kv,jv,1)*muuv2*gamma/pr+(dez*ztx(kv,jv,1)+dee*et
1 x(kv,jv,1))*muuv02*gamma/pr+deev2*etx(kv,jv,1)*muu0*gamma/pr+rh
2 ov(kv,jv,1)*txyuv02/rho(kv,jv,1)+rhov(kv,jv,1)*txxuv02/rho(kv,j
3 v,1)
bxuv03 = deev3*etx(kv,jv,1)*muu0*gamma/pr
bxuv10 = dezu1*ztx(kv,jv,1)*muuv0*gamma/pr+(dez*ztx(kv,jv,1)+dee*et
1 x(kv,jv,1))*muuv10*gamma/pr+deev0*etx(kv,jv,1)*muu1*gamma/pr+rh
2 ov(kv,jv,1)*txyuv10/rho(kv,jv,1)+rhov(kv,jv,1)*txxuv10/rho(kv,j
3 v,1)
bxuv11 = dezu1*ztx(kv,jv,1)*muuv1*gamma/pr+(dez*ztx(kv,jv,1)+dee*et
1 x(kv,jv,1))*muuv11*gamma/pr+deev1*etx(kv,jv,1)*muu1*gamma/pr+rh

```

```

2   ov(kv,jv,1)*txyuv11/rho(kv,jv,1)+rho(kv,jv,1)*txxuv11/rho(kv,j
3   v,1)
  bxuv12 = dezu1*ztx(kv,jv,1)*muv2*gamma/pr+(dez*ztx(kv,jv,1)+dee*et
1   x(kv,jv,1))*muuv12*gamma/pr+deev2*etx(kv,jv,1)*muu1*gamma/pr+rh
2   ov(kv,jv,1)*txyuv12/rho(kv,jv,1)+rho(kv,jv,1)*txxuv12/rho(kv,j
3   v,1)
  bxuv13 = deev3*etx(kv,jv,1)*muu1*gamma/pr
  bxuv20 = dezu2*ztx(kv,jv,1)*muv0*gamma/pr+(dez*ztx(kv,jv,1)+dee*et
1   x(kv,jv,1))*muuv20*gamma/pr+deev0*etx(kv,jv,1)*muu2*gamma/pr+rh
2   ov(kv,jv,1)*txyuv20/rho(kv,jv,1)+rho(kv,jv,1)*txxuv20/rho(kv,j
3   v,1)
  bxuv21 = dezu2*ztx(kv,jv,1)*muv1*gamma/pr+(dez*ztx(kv,jv,1)+dee*et
1   x(kv,jv,1))*muuv21*gamma/pr+deev1*etx(kv,jv,1)*muu2*gamma/pr+rh
2   ov(kv,jv,1)*txyuv21/rho(kv,jv,1)+rho(kv,jv,1)*txxuv21/rho(kv,j
3   v,1)
  bxuv22 = dezu2*ztx(kv,jv,1)*muv2*gamma/pr+(dez*ztx(kv,jv,1)+dee*et
1   x(kv,jv,1))*muuv22*gamma/pr+deev2*etx(kv,jv,1)*muu2*gamma/pr+rh
2   ov(kv,jv,1)*txyuv22/rho(kv,jv,1)+rho(kv,jv,1)*txxuv22/rho(kv,j
3   v,1)
  bxuv23 = deev3*etx(kv,jv,1)*muu2*gamma/pr
  bxuv30 = dezu3*ztx(kv,jv,1)*muv0*gamma/pr
  bxuv31 = dezu3*ztx(kv,jv,1)*muv1*gamma/pr
  bxuv32 = dezu3*ztx(kv,jv,1)*muv2*gamma/pr
  bxvu00 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvu00*gamma/pr+dezu0
1   *ztx(kv,jv,1)*muv0*gamma/pr+deev0*etx(kv,jv,1)*muu0*gamma/pr+rh
2   ov(kv,jv,1)*txyv00/rho(kv,jv,1)+rho(kv,jv,1)*txxvu00/rho(kv,j
3   v,1)
  bxvu01 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvu01*gamma/pr+dezu1
1   *ztx(kv,jv,1)*muv0*gamma/pr+deev0*etx(kv,jv,1)*muu1*gamma/pr+rh
2   ov(kv,jv,1)*txyv01/rho(kv,jv,1)+rho(kv,jv,1)*txxvu01/rho(kv,j
3   v,1)
  bxvu02 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvu02*gamma/pr+dezu2
1   *ztx(kv,jv,1)*muv0*gamma/pr+deev0*etx(kv,jv,1)*muu2*gamma/pr+rh
2   ov(kv,jv,1)*txyv02/rho(kv,jv,1)+rho(kv,jv,1)*txxvu02/rho(kv,j
3   v,1)
  bxvu03 = dezu3*ztx(kv,jv,1)*muv0*gamma/pr
  bxvu10 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvu10*gamma/pr+dezu0
1   *ztx(kv,jv,1)*muv1*gamma/pr+deev1*etx(kv,jv,1)*muu0*gamma/pr+rh
2   ov(kv,jv,1)*txyv10/rho(kv,jv,1)+rho(kv,jv,1)*txxvu10/rho(kv,j
3   v,1)
  bxvu11 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvu11*gamma/pr+dezu1
1   *ztx(kv,jv,1)*muv1*gamma/pr+deev1*etx(kv,jv,1)*muu1*gamma/pr+rh
2   ov(kv,jv,1)*txyv11/rho(kv,jv,1)+rho(kv,jv,1)*txxvu11/rho(kv,j
3   v,1)
  bxvu12 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvu12*gamma/pr+dezu2
1   *ztx(kv,jv,1)*muv1*gamma/pr+deev1*etx(kv,jv,1)*muu2*gamma/pr+rh
2   ov(kv,jv,1)*txyv12/rho(kv,jv,1)+rho(kv,jv,1)*txxvu12/rho(kv,j
3   v,1)
  bxvu13 = dezu3*ztx(kv,jv,1)*muv1*gamma/pr
  bxvu20 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvu20*gamma/pr+dezu0
1   *ztx(kv,jv,1)*muv2*gamma/pr+deev2*etx(kv,jv,1)*muu0*gamma/pr+rh
2   ov(kv,jv,1)*txyv20/rho(kv,jv,1)+rho(kv,jv,1)*txxvu20/rho(kv,j
3   v,1)
  bxvu21 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvu21*gamma/pr+dezu1
1   *ztx(kv,jv,1)*muv2*gamma/pr+deev2*etx(kv,jv,1)*muu1*gamma/pr+rh
2   ov(kv,jv,1)*txyv21/rho(kv,jv,1)+rho(kv,jv,1)*txxvu21/rho(kv,j
3   v,1)
  bxvu22 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvu22*gamma/pr+dezu2
1   *ztx(kv,jv,1)*muv2*gamma/pr+deev2*etx(kv,jv,1)*muu2*gamma/pr+rh

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2  ov(kv,jv,1)*txyvu22/rho(kv,jv,1)+rhov(kv,jv,1)*txxvu22/rho(kv,j
3  v,1)
  bxvu23 = dezu3*ztx(kv,jv,1)*muv2*gamma/pr
  bxvu30 = deev3*etx(kv,jv,1)*muu0*gamma/pr
  bxvu31 = deev3*etx(kv,jv,1)*muu1*gamma/pr
  bxvu32 = deev3*etx(kv,jv,1)*muu2*gamma/pr
  bxvv00 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvv00*gamma/pr+2*dee
1  v0*etx(kv,jv,1)*muv0*gamma/pr+rhov(kv,jv,1)*txyvv00/rho(kv,jv,1
2  )+rhov(kv,jv,1)*txxvv00/rho(kv,jv,1)
  bxvv01 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvv01*gamma/pr+deev0
1  *etx(kv,jv,1)*muv1*gamma/pr+deev1*etx(kv,jv,1)*muv0*gamma/pr+rh
2  ov(kv,jv,1)*txyvv01/rho(kv,jv,1)+rhov(kv,jv,1)*txxvv01/rho(kv,j
3  v,1)
  bxvv02 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvv02*gamma/pr+deev0
1  *etx(kv,jv,1)*muv2*gamma/pr+deev2*etx(kv,jv,1)*muv0*gamma/pr+rh
2  ov(kv,jv,1)*txyvv02/rho(kv,jv,1)+rhov(kv,jv,1)*txxvv02/rho(kv,j
3  v,1)
  bxvv03 = deev3*etx(kv,jv,1)*muv0*gamma/pr
  bxvv10 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvv10*gamma/pr+deev0
1  *etx(kv,jv,1)*muv1*gamma/pr+deev1*etx(kv,jv,1)*muv0*gamma/pr+rh
2  ov(kv,jv,1)*txyvv10/rho(kv,jv,1)+rhov(kv,jv,1)*txxvv10/rho(kv,j
3  v,1)
  bxvv11 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvv11*gamma/pr+2*dee
1  v1*etx(kv,jv,1)*muv1*gamma/pr+rhov(kv,jv,1)*txyvv11/rho(kv,jv,1
2  )+rhov(kv,jv,1)*txxvv11/rho(kv,jv,1)
  bxvv12 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvv12*gamma/pr+deev1
1  *etx(kv,jv,1)*muv2*gamma/pr+deev2*etx(kv,jv,1)*muv1*gamma/pr+rh
2  ov(kv,jv,1)*txyvv12/rho(kv,jv,1)+rhov(kv,jv,1)*txxvv12/rho(kv,j
3  v,1)
  bxvv13 = deev3*etx(kv,jv,1)*muv1*gamma/pr
  bxvv20 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvv20*gamma/pr+deev0
1  *etx(kv,jv,1)*muv2*gamma/pr+deev2*etx(kv,jv,1)*muv0*gamma/pr+rh
2  ov(kv,jv,1)*txyvv20/rho(kv,jv,1)+rhov(kv,jv,1)*txxvv20/rho(kv,j
3  v,1)
  bxvv21 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvv21*gamma/pr+deev1
1  *etx(kv,jv,1)*muv2*gamma/pr+deev2*etx(kv,jv,1)*muv1*gamma/pr+rh
2  ov(kv,jv,1)*txyvv21/rho(kv,jv,1)+rhov(kv,jv,1)*txxvv21/rho(kv,j
3  v,1)
  bxvv22 = (dez*ztx(kv,jv,1)+dee*etx(kv,jv,1))*muvv22*gamma/pr+2*dee
1  v2*etx(kv,jv,1)*muv2*gamma/pr+rhov(kv,jv,1)*txyvv22/rho(kv,jv,1
2  )+rhov(kv,jv,1)*txxvv22/rho(kv,jv,1)
  bxvv23 = deev3*etx(kv,jv,1)*muv2*gamma/pr
  bxvv30 = deev3*etx(kv,jv,1)*muv0*gamma/pr
  bxvv31 = deev3*etx(kv,jv,1)*muv1*gamma/pr
  bxvv32 = deev3*etx(kv,jv,1)*muv2*gamma/pr

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```

  by = rrmu(kv,jv)*(dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*gamma/pr+rhov
1  (kv,jv,1)*tyy/rho(kv,jv,1)+rhov(kv,jv,1)*txy/rho(kv,jv,1)
  byd0 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*mud0*gamma/pr+rrmu(kv,j
1  v)*(dezd0*zty(kv,jv,1)+deed0*ety(kv,jv,1))*gamma/pr+rhov(kv,jv,
2  1)*tyyd0/rho(kv,jv,1)-rhov(kv,jv,1)*tyy/rho(kv,jv,1)**2+rhov(kv
3  ,jv,1)*txyd0/rho(kv,jv,1)-rhov(kv,jv,1)*txy/rho(kv,jv,1)**2
  byd1 = rrmu(kv,jv)*(dezd1*zty(kv,jv,1)+deed1*ety(kv,jv,1))*gamma/p
1  r+rhov(kv,jv,1)*tyyd1/rho(kv,jv,1)+rhov(kv,jv,1)*txyd1/rho(kv,j
2  v,1)+txy/rho(kv,jv,1)
  byd2 = rrmu(kv,jv)*(dezd2*zty(kv,jv,1)+deed2*ety(kv,jv,1))*gamma/p
1  r+rhov(kv,jv,1)*tyyd2/rho(kv,jv,1)+tyy/rho(kv,jv,1)+rhov(kv,jv,
2  1)*txyd2/rho(kv,jv,1)

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```

byd3 = rrmu(kv,jv)*(dez3*sty(kv,jv,1)+deed3*ety(kv,jv,1))*gamma/p
1 r
byu0 = (dez*sty(kv,jv,1)+dee*ety(kv,jv,1))*muu0*gamma/pr+dezu0*rrm
1 u(kv,jv)*sty(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyu0/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txyu0/rho(kv,jv,1)
byu1 = (dez*sty(kv,jv,1)+dee*ety(kv,jv,1))*muu1*gamma/pr+dezu1*rrm
1 u(kv,jv)*sty(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyu1/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txyu1/rho(kv,jv,1)
byu2 = (dez*sty(kv,jv,1)+dee*ety(kv,jv,1))*muu2*gamma/pr+dezu2*rrm
1 u(kv,jv)*sty(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyu2/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txyu2/rho(kv,jv,1)
byu3 = dezu3*rrmu(kv,jv)*sty(kv,jv,1)*gamma/pr
byv0 = (dez*sty(kv,jv,1)+dee*ety(kv,jv,1))*muv0*gamma/pr+deev0*rrm
1 u(kv,jv)*ety(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyv0/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txyv0/rho(kv,jv,1)
byv1 = (dez*sty(kv,jv,1)+dee*ety(kv,jv,1))*muv1*gamma/pr+deev1*rrm
1 u(kv,jv)*ety(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyv1/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txyv1/rho(kv,jv,1)
byv2 = (dez*sty(kv,jv,1)+dee*ety(kv,jv,1))*muv2*gamma/pr+deev2*rrm
1 u(kv,jv)*ety(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyv2/rho(kv,jv,1)
2 +rhov(kv,jv,1)*txyv2/rho(kv,jv,1)
byv3 = deev3*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr
bydd00 = (dez*sty(kv,jv,1)+dee*ety(kv,jv,1))*mudd00*gamma/pr+2*(de
1 zd0*sty(kv,jv,1)+deed0*ety(kv,jv,1))*mud0*gamma/pr+rrmu(kv,jv)*
2 (dezdd00*sty(kv,jv,1)+deedd00*ety(kv,jv,1))*gamma/pr+rhov(kv,jv
3 ,1)*tyydd00/rho(kv,jv,1)-2*rhov(kv,jv,1)*tyyd0/rho(kv,jv,1)**2+
4 2*rhov(kv,jv,1)*tyy/rho(kv,jv,1)**3+rhov(kv,jv,1)*txydd00/rho(k
5 v,jv,1)-2*rhov(kv,jv,1)*txyd0/rho(kv,jv,1)**2+2*rhov(kv,jv,1)*t
6 xy/rho(kv,jv,1)**3
bydd01 = (dezdd1*sty(kv,jv,1)+deedd1*ety(kv,jv,1))*mud0*gamma/pr+rrm
1 u(kv,jv)*(dezdd01*sty(kv,jv,1)+deedd01*ety(kv,jv,1))*gamma/pr+r
2 hov(kv,jv,1)*tyydd01/rho(kv,jv,1)-rhov(kv,jv,1)*tyyd1/rho(kv,jv
3 ,1)**2+rhov(kv,jv,1)*txydd01/rho(kv,jv,1)-rhov(kv,jv,1)*txyd1/r
4 ho(kv,jv,1)**2+txyd0/rho(kv,jv,1)-txy/rho(kv,jv,1)**2
bydd02 = (dezdd2*sty(kv,jv,1)+deedd2*ety(kv,jv,1))*mud0*gamma/pr+rrm
1 u(kv,jv)*(dezdd02*sty(kv,jv,1)+deedd02*ety(kv,jv,1))*gamma/pr+r
2 hov(kv,jv,1)*tyydd02/rho(kv,jv,1)-rhov(kv,jv,1)*tyyd2/rho(kv,jv
3 ,1)**2+tyyd0/rho(kv,jv,1)-tyy/rho(kv,jv,1)**2+rhov(kv,jv,1)*txy
4 dd02/rho(kv,jv,1)-rhov(kv,jv,1)*txyd2/rho(kv,jv,1)**2
bydd03 = (dezdd3*sty(kv,jv,1)+deedd3*ety(kv,jv,1))*mud0*gamma/pr+rrm
1 u(kv,jv)*(dezdd03*sty(kv,jv,1)+deedd03*ety(kv,jv,1))*gamma/pr
bydd10 = (dezdd10*sty(kv,jv,1)+deedd10*ety(kv,jv,1))*mud0*gamma/pr+rrm
1 u(kv,jv)*(dezdd10*sty(kv,jv,1)+deedd10*ety(kv,jv,1))*gamma/pr+r
2 hov(kv,jv,1)*tyydd10/rho(kv,jv,1)-rhov(kv,jv,1)*tyyd1/rho(kv,jv
3 ,1)**2+rhov(kv,jv,1)*txydd10/rho(kv,jv,1)-rhov(kv,jv,1)*txyd1/r
4 ho(kv,jv,1)**2+txyd0/rho(kv,jv,1)-txy/rho(kv,jv,1)**2
bydd11 = rrmu(kv,jv)*(dezdd11*sty(kv,jv,1)+deedd11*ety(kv,jv,1))*g
1 amma/pr+2*txyd1/rho(kv,jv,1)
bydd12 = tyyd1/rho(kv,jv,1)+txyd2/rho(kv,jv,1)
bydd20 = (dezdd2*sty(kv,jv,1)+deedd2*ety(kv,jv,1))*mud0*gamma/pr+rrm
1 u(kv,jv)*(dezdd20*sty(kv,jv,1)+deedd20*ety(kv,jv,1))*gamma/pr+r
2 hov(kv,jv,1)*tyydd20/rho(kv,jv,1)-rhov(kv,jv,1)*tyyd2/rho(kv,jv
3 ,1)**2+tyyd0/rho(kv,jv,1)-tyy/rho(kv,jv,1)**2+rhov(kv,jv,1)*txy
4 dd20/rho(kv,jv,1)-rhov(kv,jv,1)*txyd2/rho(kv,jv,1)**2
bydd21 = tyyd1/rho(kv,jv,1)+txyd2/rho(kv,jv,1)
bydd22 = rrmu(kv,jv)*(dezdd22*sty(kv,jv,1)+deedd22*ety(kv,jv,1))*g
1 amma/pr+2*tyyd2/rho(kv,jv,1)
bydd30 = (dezdd3*sty(kv,jv,1)+deedd3*ety(kv,jv,1))*mud0*gamma/pr+rrm
1 u(kv,jv)*(dezdd30*sty(kv,jv,1)+deedd30*ety(kv,jv,1))*gamma/pr

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bydd00 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*mudd00*gamma/pr+2*(de
1  zd0*zty(kv,jv,1)+deed0*ety(kv,jv,1))*mud0*gamma/pr+rrmu(kv,jv)*
2  (dezdd00*zty(kv,jv,1)+deedd00*ety(kv,jv,1))*gamma/pr+rhov(kv,jv
3  ,1)*tyydd00/rho(kv,jv,1)-2*rhov(kv,jv,1)*tyyd0/rho(kv,jv,1)**2+
4  2*rhov(kv,jv,1)*tyy/rho(kv,jv,1)**3+rhov(kv,jv,1)*txydd00/rho(k
5  v,jv,1)-2*rhou(kv,jv,1)*txyd0/rho(kv,jv,1)**2+2*rhou(kv,jv,1)*t
6  xy/rho(kv,jv,1)**3
bydd01 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd01*zty(kv,jv,1)+deedd01*ety(kv,jv,1))*gamma/pr+r
2  hov(kv,jv,1)*tyydd01/rho(kv,jv,1)-rhov(kv,jv,1)*tyyd1/rho(kv,jv
3  ,1)**2+rhou(kv,jv,1)*txydd01/rho(kv,jv,1)-rhou(kv,jv,1)*txyd1/r
4  ho(kv,jv,1)**2+txyd0/rho(kv,jv,1)-txy/rho(kv,jv,1)**2
bydd02 = (dezdd2*zty(kv,jv,1)+deedd2*ety(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd02*zty(kv,jv,1)+deedd02*ety(kv,jv,1))*gamma/pr+r
2  hov(kv,jv,1)*tyydd02/rho(kv,jv,1)-rhov(kv,jv,1)*tyyd2/rho(kv,jv
3  ,1)**2+tyyd0/rho(kv,jv,1)-tyy/rho(kv,jv,1)**2+rhou(kv,jv,1)*txy
4  dd02/rho(kv,jv,1)-rhou(kv,jv,1)*txyd2/rho(kv,jv,1)**2
bydd03 = (dezdd3*zty(kv,jv,1)+deedd3*ety(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd03*zty(kv,jv,1)+deedd03*ety(kv,jv,1))*gamma/pr
bydd10 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd10*zty(kv,jv,1)+deedd10*ety(kv,jv,1))*gamma/pr+r
2  hov(kv,jv,1)*tyydd10/rho(kv,jv,1)-rhov(kv,jv,1)*tyyd1/rho(kv,jv
3  ,1)**2+rhou(kv,jv,1)*txydd10/rho(kv,jv,1)-rhou(kv,jv,1)*txyd1/r
4  ho(kv,jv,1)**2+txyd0/rho(kv,jv,1)-txy/rho(kv,jv,1)**2
bydd11 = rrmu(kv,jv)*(dezdd11*zty(kv,jv,1)+deedd11*ety(kv,jv,1))*g
1  amma/pr+2*txyd1/rho(kv,jv,1)
bydd12 = tyyd1/rho(kv,jv,1)+txyd2/rho(kv,jv,1)
bydd20 = (dezdd2*zty(kv,jv,1)+deedd2*ety(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd20*zty(kv,jv,1)+deedd20*ety(kv,jv,1))*gamma/pr+r
2  hov(kv,jv,1)*tyydd20/rho(kv,jv,1)-rhov(kv,jv,1)*tyyd2/rho(kv,jv
3  ,1)**2+tyyd0/rho(kv,jv,1)-tyy/rho(kv,jv,1)**2+rhou(kv,jv,1)*txy
4  dd20/rho(kv,jv,1)-rhou(kv,jv,1)*txyd2/rho(kv,jv,1)**2
bydd21 = tyyd1/rho(kv,jv,1)+txyd2/rho(kv,jv,1)
bydd22 = rrmu(kv,jv)*(dezdd22*zty(kv,jv,1)+deedd22*ety(kv,jv,1))*g
1  amma/pr+2*tyyd2/rho(kv,jv,1)
bydd30 = (dezdd3*zty(kv,jv,1)+deedd3*ety(kv,jv,1))*mud0*gamma/pr+rrm
1  u(kv,jv)*(dezdd30*zty(kv,jv,1)+deedd30*ety(kv,jv,1))*gamma/pr
bydu00 = (dezdd0*zty(kv,jv,1)+deedd0*ety(kv,jv,1))*muu0*gamma/pr+(de
1  z*zty(kv,jv,1)+dee*ety(kv,jv,1))*mudu00*gamma/pr+dezu0*zty(kv,j
2  v,1)*mud0*gamma/pr+dezdu00*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*tyyu0/rho(kv,jv,1)**2+rhov(kv,jv,1)*tyydu00/rho(kv,
4  jv,1)-rhou(kv,jv,1)*txyu0/rho(kv,jv,1)**2+rhou(kv,jv,1)*txydu00
5  /rho(kv,jv,1)
bydu01 = (dezdd0*zty(kv,jv,1)+deedd0*ety(kv,jv,1))*muu1*gamma/pr+(de
1  z*zty(kv,jv,1)+dee*ety(kv,jv,1))*mudu01*gamma/pr+dezu1*zty(kv,j
2  v,1)*mud0*gamma/pr+dezdu01*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*tyyu1/rho(kv,jv,1)**2+rhov(kv,jv,1)*tyydu01/rho(kv,
4  jv,1)-rhou(kv,jv,1)*txyu1/rho(kv,jv,1)**2+rhou(kv,jv,1)*txydu01
5  /rho(kv,jv,1)
bydu02 = (dezdd0*zty(kv,jv,1)+deedd0*ety(kv,jv,1))*muu2*gamma/pr+(de
1  z*zty(kv,jv,1)+dee*ety(kv,jv,1))*mudu02*gamma/pr+dezu2*zty(kv,j
2  v,1)*mud0*gamma/pr+dezdu02*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*tyyu2/rho(kv,jv,1)**2+rhov(kv,jv,1)*tyydu02/rho(kv,
4  jv,1)-rhou(kv,jv,1)*txyu2/rho(kv,jv,1)**2+rhou(kv,jv,1)*txydu02
5  /rho(kv,jv,1)
bydu03 = dezu3*zty(kv,jv,1)*mud0*gamma/pr+dezdu03*rrmu(kv,jv)*zty(
1  kv,jv,1)*gamma/pr
bydul0 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muu0*gamma/pr+dez
1  dul0*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyydu10/rh

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2  o(kv,jv,1)+txyu0/rho(kv,jv,1)+rhov(kv,jv,1)*txydul0/rho(kv,jv,1
3  )
  bydul1 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muul*gamma/pr+dez
1  dul1*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyydul1/rh
2  o(kv,jv,1)+txyul/rho(kv,jv,1)+rhov(kv,jv,1)*txydul1/rho(kv,jv,1
3  )
  bydul2 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muu2*gamma/pr+rho
1  v(kv,jv,1)*tyydul2/rho(kv,jv,1)+txyu2/rho(kv,jv,1)+rhov(kv,jv,1
2  )*txydul2/rho(kv,jv,1)
  bydu20 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muu0*gamma/pr+dez
1  du20*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr+tyyu0/rho(kv,jv,1)+rhov(
2  kv,jv,1)*tyydu20/rho(kv,jv,1)+rhov(kv,jv,1)*txydu20/rho(kv,jv,1
3  )
  bydu21 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muul*gamma/pr+tyy
1  ul/rho(kv,jv,1)+rhov(kv,jv,1)*tyydu21/rho(kv,jv,1)+rhov(kv,jv,1
2  )*txydu21/rho(kv,jv,1)
  bydu22 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muu2*gamma/pr+dez
1  du22*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr+tyyu2/rho(kv,jv,1)+rhov(
2  kv,jv,1)*tyydu22/rho(kv,jv,1)+rhov(kv,jv,1)*txydu22/rho(kv,jv,1
3  )
  bydu30 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muu0*gamma/pr+dez
1  du30*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr
  bydu31 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muul*gamma/pr
  bydu32 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muu2*gamma/pr
  bydv00 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muv0*gamma/pr+(de
1  z*zty(kv,jv,1)+dee*ety(kv,jv,1))*mudv00*gamma/pr+deev0*ety(kv,j
2  v,1)*mud0*gamma/pr+deedv00*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*tyyv0/rho(kv,jv,1)**2+rhov(kv,jv,1)*tyydv00/rho(kv,
4  jv,1)-rhov(kv,jv,1)*txyv0/rho(kv,jv,1)**2+rhov(kv,jv,1)*txydv00
5  /rho(kv,jv,1)
  bydv01 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muv1*gamma/pr+(de
1  z*zty(kv,jv,1)+dee*ety(kv,jv,1))*mudv01*gamma/pr+deev1*ety(kv,j
2  v,1)*mud0*gamma/pr+deedv01*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*tyyv1/rho(kv,jv,1)**2+rhov(kv,jv,1)*tyydv01/rho(kv,
4  jv,1)-rhov(kv,jv,1)*txyv1/rho(kv,jv,1)**2+rhov(kv,jv,1)*txydv01
5  /rho(kv,jv,1)
  bydv02 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muv2*gamma/pr+(de
1  z*zty(kv,jv,1)+dee*ety(kv,jv,1))*mudv02*gamma/pr+deev2*ety(kv,j
2  v,1)*mud0*gamma/pr+deedv02*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr-rh
3  ov(kv,jv,1)*tyyv2/rho(kv,jv,1)**2+rhov(kv,jv,1)*tyydv02/rho(kv,
4  jv,1)-rhov(kv,jv,1)*txyv2/rho(kv,jv,1)**2+rhov(kv,jv,1)*txydv02
5  /rho(kv,jv,1)
  bydv03 = deev3*ety(kv,jv,1)*mud0*gamma/pr+deedv03*rrmu(kv,jv)*ety(
1  kv,jv,1)*gamma/pr
  bydv10 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muv0*gamma/pr+dee
1  dv10*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyydv10/rh
2  o(kv,jv,1)+txyv0/rho(kv,jv,1)+rhov(kv,jv,1)*txydv10/rho(kv,jv,1
3  )
  bydv11 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muv1*gamma/pr+dee
1  dv11*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyydv11/rh
2  o(kv,jv,1)+txyv1/rho(kv,jv,1)+rhov(kv,jv,1)*txydv11/rho(kv,jv,1
3  )
  bydv12 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muv2*gamma/pr+rho
1  v(kv,jv,1)*tyydv12/rho(kv,jv,1)+txyv2/rho(kv,jv,1)+rhov(kv,jv,1
2  )*txydv12/rho(kv,jv,1)
  bydv20 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muv0*gamma/pr+dee
1  dv20*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr+tyyv0/rho(kv,jv,1)+rhov(
2  kv,jv,1)*tyydv20/rho(kv,jv,1)+rhov(kv,jv,1)*txydv20/rho(kv,jv,1
3  )

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bydv21 = (dezd2*zty(kv,jv,1)+deed2*ety(kv,jv,1))*muv1*gamma/pr+tyy
1  v1/rho(kv,jv,1)+rhov(kv,jv,1)*tyydv21/rho(kv,jv,1)+rhou(kv,jv,1
2  )*txydv21/rho(kv,jv,1)
bydv22 = (dezd2*zty(kv,jv,1)+deed2*ety(kv,jv,1))*muv2*gamma/pr+dee
1  dv22*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr+tyyv2/rho(kv,jv,1)+rhov(
2  kv,jv,1)*tyydv22/rho(kv,jv,1)+rhou(kv,jv,1)*txydv22/rho(kv,jv,1
3  )
bydv30 = (dezd3*zty(kv,jv,1)+deed3*ety(kv,jv,1))*muv0*gamma/pr+dee
1  dv30*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr
bydv31 = (dezd3*zty(kv,jv,1)+deed3*ety(kv,jv,1))*muv1*gamma/pr
bydv32 = (dezd3*zty(kv,jv,1)+deed3*ety(kv,jv,1))*muv2*gamma/pr
byud00 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muud00*gamma/pr+(dezd
1  0*zty(kv,jv,1)+deed0*ety(kv,jv,1))*muu0*gamma/pr+dezu0*zty(kv,j
2  v,1)*mud0*gamma/pr+dezud0*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr+rh
3  ov(kv,jv,1)*tyyud00/rho(kv,jv,1)-rhov(kv,jv,1)*tyyu0/rho(kv,jv,
4  1)**2+rhou(kv,jv,1)*txyud00/rho(kv,jv,1)-rhou(kv,jv,1)*txyu0/rh
5  o(kv,jv,1)**2
byud01 = (dezd1*zty(kv,jv,1)+deed1*ety(kv,jv,1))*muu0*gamma/pr+dez
1  ud01*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyud01/rh
2  o(kv,jv,1)+rhou(kv,jv,1)*txyud01/rho(kv,jv,1)+txyu0/rho(kv,jv,1
3  )
byud02 = (dezd2*zty(kv,jv,1)+deed2*ety(kv,jv,1))*muu0*gamma/pr+dez
1  ud02*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyud02/rh
2  o(kv,jv,1)+tyyu0/rho(kv,jv,1)+rhou(kv,jv,1)*txyud02/rho(kv,jv,1
3  )
byud03 = (dezd3*zty(kv,jv,1)+deed3*ety(kv,jv,1))*muu0*gamma/pr+dez
1  ud03*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr
byud10 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muud10*gamma/pr+(dezd
1  0*zty(kv,jv,1)+deed0*ety(kv,jv,1))*muu1*gamma/pr+dezu1*zty(kv,j
2  v,1)*mud0*gamma/pr+dezud10*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr+rh
3  ov(kv,jv,1)*tyyud10/rho(kv,jv,1)-rhov(kv,jv,1)*tyyu1/rho(kv,jv,
4  1)**2+rhou(kv,jv,1)*txyud10/rho(kv,jv,1)-rhou(kv,jv,1)*txyu1/rh
5  o(kv,jv,1)**2
byud11 = (dezd1*zty(kv,jv,1)+deed1*ety(kv,jv,1))*muu1*gamma/pr+dez
1  ud11*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyud11/rh
2  o(kv,jv,1)+rhou(kv,jv,1)*txyud11/rho(kv,jv,1)+txyu1/rho(kv,jv,1
3  )
byud12 = (dezd2*zty(kv,jv,1)+deed2*ety(kv,jv,1))*muu1*gamma/pr+rho
1  v(kv,jv,1)*tyyud12/rho(kv,jv,1)+tyyu1/rho(kv,jv,1)+rhou(kv,jv,1
2  )*txyud12/rho(kv,jv,1)
byud13 = (dezd3*zty(kv,jv,1)+deed3*ety(kv,jv,1))*muu1*gamma/pr
byud20 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muud20*gamma/pr+(dezd
1  0*zty(kv,jv,1)+deed0*ety(kv,jv,1))*muu2*gamma/pr+dezu2*zty(kv,j
2  v,1)*mud0*gamma/pr+dezud20*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr+rh
3  ov(kv,jv,1)*tyyud20/rho(kv,jv,1)-rhov(kv,jv,1)*tyyu2/rho(kv,jv,
4  1)**2+rhou(kv,jv,1)*txyud20/rho(kv,jv,1)-rhou(kv,jv,1)*txyu2/rh
5  o(kv,jv,1)**2
byud21 = (dezd1*zty(kv,jv,1)+deed1*ety(kv,jv,1))*muu2*gamma/pr+rho
1  v(kv,jv,1)*tyyud21/rho(kv,jv,1)+rhou(kv,jv,1)*txyud21/rho(kv,jv
2  ,1)+txyu2/rho(kv,jv,1)
byud22 = (dezd2*zty(kv,jv,1)+deed2*ety(kv,jv,1))*muu2*gamma/pr+dez
1  ud22*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyud22/rh
2  o(kv,jv,1)+tyyu2/rho(kv,jv,1)+rhou(kv,jv,1)*txyud22/rho(kv,jv,1
3  )
byud23 = (dezd3*zty(kv,jv,1)+deed3*ety(kv,jv,1))*muu2*gamma/pr
byud30 = dezu3*zty(kv,jv,1)*mud0*gamma/pr+dezud30*rrmu(kv,jv)*zty(
1  kv,jv,1)*gamma/pr
byvd00 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvd00*gamma/pr+(dezd
1  0*zty(kv,jv,1)+deed0*ety(kv,jv,1))*muv0*gamma/pr+deev0*ety(kv,j

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2   v,1)*mud0*gamma/pr+deevd00*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr+rh
3   ov(kv,jv,1)*tyyvd00/rho(kv,jv,1)-rhov(kv,jv,1)*tyyv0/rho(kv,jv,
4   1)**2+rhou(kv,jv,1)*txyvd00/rho(kv,jv,1)-rhou(kv,jv,1)*txyv0/rh
5   o(kv,jv,1)**2
   byvd01 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muv0*gamma/pr+dee
1   vd01*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyvd01/rh
2   o(kv,jv,1)+rhou(kv,jv,1)*txyvd01/rho(kv,jv,1)+txyv0/rho(kv,jv,1
3   )
   byvd02 = (dezdl*zty(kv,jv,1)+deed2*ety(kv,jv,1))*muv0*gamma/pr+dee
1   vd02*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyvd02/rh
2   o(kv,jv,1)+tyyv0/rho(kv,jv,1)+rhou(kv,jv,1)*txyvd02/rho(kv,jv,1
3   )
   byvd03 = (dezdl*zty(kv,jv,1)+deed3*ety(kv,jv,1))*muv0*gamma/pr+dee
1   vd03*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr
   byvd10 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvd10*gamma/pr+(dez
1   0*zty(kv,jv,1)+deed0*ety(kv,jv,1))*muvl*gamma/pr+deevl*ety(kv,j
2   v,1)*mud0*gamma/pr+deevd10*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr+rh
3   ov(kv,jv,1)*tyyvd10/rho(kv,jv,1)-rhov(kv,jv,1)*tyyv1/rho(kv,jv,
4   1)**2+rhou(kv,jv,1)*txyvd10/rho(kv,jv,1)-rhou(kv,jv,1)*txyv1/rh
5   o(kv,jv,1)**2
   byvd11 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muvl*gamma/pr+dee
1   vd11*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyvd11/rh
2   o(kv,jv,1)+rhou(kv,jv,1)*txyvd11/rho(kv,jv,1)+txyv1/rho(kv,jv,1
3   )
   byvd12 = (dezdl*zty(kv,jv,1)+deed2*ety(kv,jv,1))*muvl*gamma/pr+rho
1   v(kv,jv,1)*tyyvd12/rho(kv,jv,1)+tyyv1/rho(kv,jv,1)+rhou(kv,jv,1
2   )*txyvd12/rho(kv,jv,1)
   byvd13 = (dezdl*zty(kv,jv,1)+deed3*ety(kv,jv,1))*muvl*gamma/pr
   byvd20 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvd20*gamma/pr+(dez
1   0*zty(kv,jv,1)+deed0*ety(kv,jv,1))*muv2*gamma/pr+deev2*ety(kv,j
2   v,1)*mud0*gamma/pr+deevd20*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr+rh
3   ov(kv,jv,1)*tyyvd20/rho(kv,jv,1)-rhov(kv,jv,1)*tyyv2/rho(kv,jv,
4   1)**2+rhou(kv,jv,1)*txyvd20/rho(kv,jv,1)-rhou(kv,jv,1)*txyv2/rh
5   o(kv,jv,1)**2
   byvd21 = (dezdl*zty(kv,jv,1)+deedl*ety(kv,jv,1))*muv2*gamma/pr+rho
1   v(kv,jv,1)*tyyvd21/rho(kv,jv,1)+rhou(kv,jv,1)*txyvd21/rho(kv,jv,
2   1)+txyv2/rho(kv,jv,1)
   byvd22 = (dezdl*zty(kv,jv,1)+deed2*ety(kv,jv,1))*muv2*gamma/pr+dee
1   vd22*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr+rhov(kv,jv,1)*tyyvd22/rh
2   o(kv,jv,1)+tyyv2/rho(kv,jv,1)+rhou(kv,jv,1)*txyvd22/rho(kv,jv,1
3   )
   byvd23 = (dezdl*zty(kv,jv,1)+deed3*ety(kv,jv,1))*muv2*gamma/pr
   byvd30 = deev3*ety(kv,jv,1)*mud0*gamma/pr+deevd30*rrmu(kv,jv)*ety(
1   kv,jv,1)*gamma/pr
   byuu00 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muuu00*gamma/pr+2*dez
1   u0*zty(kv,jv,1)*muu0*gamma/pr+rhov(kv,jv,1)*tyyuu00/rho(kv,jv,1
2   )+rhou(kv,jv,1)*txyuu00/rho(kv,jv,1)
   byuu01 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muuu01*gamma/pr+dezu0
1   *zty(kv,jv,1)*muu1*gamma/pr+dezu1*zty(kv,jv,1)*muu0*gamma/pr+rh
2   ov(kv,jv,1)*tyyuu01/rho(kv,jv,1)+rhou(kv,jv,1)*txyuu01/rho(kv,j
3   v,1)
   byuu02 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muuu02*gamma/pr+dezu0
1   *zty(kv,jv,1)*muu2*gamma/pr+dezu2*zty(kv,jv,1)*muu0*gamma/pr+rh
2   ov(kv,jv,1)*tyyuu02/rho(kv,jv,1)+rhou(kv,jv,1)*txyuu02/rho(kv,j
3   v,1)
   byuu03 = dezu3*zty(kv,jv,1)*muu0*gamma/pr
   byuu10 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muuu10*gamma/pr+dezu0
1   *zty(kv,jv,1)*muu1*gamma/pr+dezu1*zty(kv,jv,1)*muu0*gamma/pr+rh
2   ov(kv,jv,1)*tyyuu10/rho(kv,jv,1)+rhou(kv,jv,1)*txyuu10/rho(kv,j

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3   v,1)
byuu11 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muu11*gamma/pr+2*dez
1   ul*zty(kv,jv,1)*muul*gamma/pr+rhov(kv,jv,1)*tyyu11/rho(kv,jv,1
2   )+rhov(kv,jv,1)*txyu11/rho(kv,jv,1)
byuu12 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muu12*gamma/pr+dezu1
1   *zty(kv,jv,1)*muu2*gamma/pr+dezu2*zty(kv,jv,1)*muul*gamma/pr+rh
2   ov(kv,jv,1)*tyyu12/rho(kv,jv,1)+rhov(kv,jv,1)*txyu12/rho(kv,j
3   v,1)
byuu13 = dezu3*zty(kv,jv,1)*muul*gamma/pr
byuu20 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muu20*gamma/pr+dezu0
1   *zty(kv,jv,1)*muu2*gamma/pr+dezu2*zty(kv,jv,1)*muu0*gamma/pr+rh
2   ov(kv,jv,1)*tyyu20/rho(kv,jv,1)+rhov(kv,jv,1)*txyu20/rho(kv,j
3   v,1)
byuu21 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muu21*gamma/pr+dezu1
1   *zty(kv,jv,1)*muu2*gamma/pr+dezu2*zty(kv,jv,1)*muul*gamma/pr+rh
2   ov(kv,jv,1)*tyyu21/rho(kv,jv,1)+rhov(kv,jv,1)*txyu21/rho(kv,j
3   v,1)
byuu22 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muu22*gamma/pr+2*dez
1   u2*zty(kv,jv,1)*muu2*gamma/pr+rhov(kv,jv,1)*tyyu22/rho(kv,jv,1
2   )+rhov(kv,jv,1)*txyu22/rho(kv,jv,1)
byuu23 = dezu3*zty(kv,jv,1)*muu2*gamma/pr
byuu30 = dezu3*zty(kv,jv,1)*muu0*gamma/pr
byuu31 = dezu3*zty(kv,jv,1)*muul*gamma/pr
byuu32 = dezu3*zty(kv,jv,1)*muu2*gamma/pr
byuv00 = dezu0*zty(kv,jv,1)*muu0*gamma/pr+(dez*zty(kv,jv,1)+dee*et
1   y(kv,jv,1))*muuv00*gamma/pr+deev0*ety(kv,jv,1)*muu0*gamma/pr+rh
2   ov(kv,jv,1)*tyyuv00/rho(kv,jv,1)+rhov(kv,jv,1)*txyuv00/rho(kv,j
3   v,1)
byuv01 = dezu0*zty(kv,jv,1)*muuv1*gamma/pr+(dez*zty(kv,jv,1)+dee*et
1   y(kv,jv,1))*muuv01*gamma/pr+deev1*ety(kv,jv,1)*muu0*gamma/pr+rh
2   ov(kv,jv,1)*tyyuv01/rho(kv,jv,1)+rhov(kv,jv,1)*txyuv01/rho(kv,j
3   v,1)
byuv02 = dezu0*zty(kv,jv,1)*muuv2*gamma/pr+(dez*zty(kv,jv,1)+dee*et
1   y(kv,jv,1))*muuv02*gamma/pr+deev2*ety(kv,jv,1)*muu0*gamma/pr+rh
2   ov(kv,jv,1)*tyyuv02/rho(kv,jv,1)+rhov(kv,jv,1)*txyuv02/rho(kv,j
3   v,1)
byuv03 = deev3*ety(kv,jv,1)*muu0*gamma/pr
byuv10 = dezu1*zty(kv,jv,1)*muuv0*gamma/pr+(dez*zty(kv,jv,1)+dee*et
1   y(kv,jv,1))*muuv10*gamma/pr+deev0*ety(kv,jv,1)*muul*gamma/pr+rh
2   ov(kv,jv,1)*tyyuv10/rho(kv,jv,1)+rhov(kv,jv,1)*txyuv10/rho(kv,j
3   v,1)
byuv11 = dezu1*zty(kv,jv,1)*muuv1*gamma/pr+(dez*zty(kv,jv,1)+dee*et
1   y(kv,jv,1))*muuv11*gamma/pr+deev1*ety(kv,jv,1)*muul*gamma/pr+rh
2   ov(kv,jv,1)*tyyuv11/rho(kv,jv,1)+rhov(kv,jv,1)*txyuv11/rho(kv,j
3   v,1)
byuv12 = dezu1*zty(kv,jv,1)*muuv2*gamma/pr+(dez*zty(kv,jv,1)+dee*et
1   y(kv,jv,1))*muuv12*gamma/pr+deev2*ety(kv,jv,1)*muul*gamma/pr+rh
2   ov(kv,jv,1)*tyyuv12/rho(kv,jv,1)+rhov(kv,jv,1)*txyuv12/rho(kv,j
3   v,1)
byuv13 = deev3*ety(kv,jv,1)*muul*gamma/pr
byuv20 = dezu2*zty(kv,jv,1)*muuv0*gamma/pr+(dez*zty(kv,jv,1)+dee*et
1   y(kv,jv,1))*muuv20*gamma/pr+deev0*ety(kv,jv,1)*muu2*gamma/pr+rh
2   ov(kv,jv,1)*tyyuv20/rho(kv,jv,1)+rhov(kv,jv,1)*txyuv20/rho(kv,j
3   v,1)
byuv21 = dezu2*zty(kv,jv,1)*muuv1*gamma/pr+(dez*zty(kv,jv,1)+dee*et
1   y(kv,jv,1))*muuv21*gamma/pr+deev1*ety(kv,jv,1)*muu2*gamma/pr+rh
2   ov(kv,jv,1)*tyyuv21/rho(kv,jv,1)+rhov(kv,jv,1)*txyuv21/rho(kv,j
3   v,1)
byuv22 = dezu2*zty(kv,jv,1)*muuv2*gamma/pr+(dez*zty(kv,jv,1)+dee*et

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1  y(kv,jv,1))*muuv22*gamma/pr+deev2*ety(kv,jv,1)*muu2*gamma/pr+rh
2  ov(kv,jv,1)*tyyuv22/rho(kv,jv,1)+rhov(kv,jv,1)*txyuv22/rho(kv,j
3  v,1)
byuv23 = deev3*ety(kv,jv,1)*muu2*gamma/pr
byuv30 = dezu3*zty(kv,jv,1)*muv0*gamma/pr
byuv31 = dezu3*zty(kv,jv,1)*muv1*gamma/pr
byuv32 = dezu3*zty(kv,jv,1)*muv2*gamma/pr
byvu00 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvu00*gamma/pr+dezu0
1  *zty(kv,jv,1)*muv0*gamma/pr+deev0*ety(kv,jv,1)*muu0*gamma/pr+rh
2  ov(kv,jv,1)*tyyv00/rho(kv,jv,1)+rhov(kv,jv,1)*txyv00/rho(kv,j
3  v,1)
byvu01 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvu01*gamma/pr+dezu1
1  *zty(kv,jv,1)*muv0*gamma/pr+deev0*ety(kv,jv,1)*muu1*gamma/pr+rh
2  ov(kv,jv,1)*tyyv01/rho(kv,jv,1)+rhov(kv,jv,1)*txyv01/rho(kv,j
3  v,1)
byvu02 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvu02*gamma/pr+dezu2
1  *zty(kv,jv,1)*muv0*gamma/pr+deev0*ety(kv,jv,1)*muu2*gamma/pr+rh
2  ov(kv,jv,1)*tyyv02/rho(kv,jv,1)+rhov(kv,jv,1)*txyv02/rho(kv,j
3  v,1)
byvu03 = dezu3*zty(kv,jv,1)*muv0*gamma/pr
byvu10 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvu10*gamma/pr+dezu0
1  *zty(kv,jv,1)*muv1*gamma/pr+deev1*ety(kv,jv,1)*muu0*gamma/pr+rh
2  ov(kv,jv,1)*tyyv10/rho(kv,jv,1)+rhov(kv,jv,1)*txyv10/rho(kv,j
3  v,1)
byvu11 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvu11*gamma/pr+dezu1
1  *zty(kv,jv,1)*muv1*gamma/pr+deev1*ety(kv,jv,1)*muu1*gamma/pr+rh
2  ov(kv,jv,1)*tyyv11/rho(kv,jv,1)+rhov(kv,jv,1)*txyv11/rho(kv,j
3  v,1)
byvu12 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvu12*gamma/pr+dezu2
1  *zty(kv,jv,1)*muv1*gamma/pr+deev1*ety(kv,jv,1)*muu2*gamma/pr+rh
2  ov(kv,jv,1)*tyyv12/rho(kv,jv,1)+rhov(kv,jv,1)*txyv12/rho(kv,j
3  v,1)
byvu13 = dezu3*zty(kv,jv,1)*muv1*gamma/pr
byvu20 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvu20*gamma/pr+dezu0
1  *zty(kv,jv,1)*muv2*gamma/pr+deev2*ety(kv,jv,1)*muu0*gamma/pr+rh
2  ov(kv,jv,1)*tyyv20/rho(kv,jv,1)+rhov(kv,jv,1)*txyv20/rho(kv,j
3  v,1)
byvu21 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvu21*gamma/pr+dezu1
1  *zty(kv,jv,1)*muv2*gamma/pr+deev2*ety(kv,jv,1)*muu1*gamma/pr+rh
2  ov(kv,jv,1)*tyyv21/rho(kv,jv,1)+rhov(kv,jv,1)*txyv21/rho(kv,j
3  v,1)
byvu22 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvu22*gamma/pr+dezu2
1  *zty(kv,jv,1)*muv2*gamma/pr+deev2*ety(kv,jv,1)*muu2*gamma/pr+rh
2  ov(kv,jv,1)*tyyv22/rho(kv,jv,1)+rhov(kv,jv,1)*txyv22/rho(kv,j
3  v,1)
byvu23 = dezu3*zty(kv,jv,1)*muv2*gamma/pr
byvu30 = deev3*ety(kv,jv,1)*muu0*gamma/pr
byvu31 = deev3*ety(kv,jv,1)*muu1*gamma/pr
byvu32 = deev3*ety(kv,jv,1)*muu2*gamma/pr
byvv00 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvv00*gamma/pr+2*dee
1  v0*ety(kv,jv,1)*muv0*gamma/pr+rhov(kv,jv,1)*tyyvv00/rho(kv,jv,1
2  )+rhov(kv,jv,1)*txyvv00/rho(kv,jv,1)
byvv01 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvv01*gamma/pr+deev0
1  *ety(kv,jv,1)*muv1*gamma/pr+deev1*ety(kv,jv,1)*muv0*gamma/pr+rh
2  ov(kv,jv,1)*tyyvv01/rho(kv,jv,1)+rhov(kv,jv,1)*txyvv01/rho(kv,j
3  v,1)
byvv02 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvv02*gamma/pr+deev0
1  *ety(kv,jv,1)*muv2*gamma/pr+deev2*ety(kv,jv,1)*muv0*gamma/pr+rh
2  ov(kv,jv,1)*tyyvv02/rho(kv,jv,1)+rhov(kv,jv,1)*txyvv02/rho(kv,j

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3   v,1)
  byvv03 = deev3*ety(kv,jv,1)*muv0*gamma/pr
  byvv10 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvv10*gamma/pr+deev0
1   *ety(kv,jv,1)*muv1*gamma/pr+deev1*ety(kv,jv,1)*muv0*gamma/pr+rh
2   ov(kv,jv,1)*tyyvv10/rho(kv,jv,1)+rhov(kv,jv,1)*txyvv10/rho(kv,j
3   v,1)
  byvv11 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvv11*gamma/pr+2*dee
1   v1*ety(kv,jv,1)*muv1*gamma/pr+rhov(kv,jv,1)*tyyvv11/rho(kv,jv,1
2   )+rhov(kv,jv,1)*txyvv11/rho(kv,jv,1)
  byvv12 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvv12*gamma/pr+deev1
1   *ety(kv,jv,1)*muv2*gamma/pr+deev2*ety(kv,jv,1)*muv1*gamma/pr+rh
2   ov(kv,jv,1)*tyyvv12/rho(kv,jv,1)+rhov(kv,jv,1)*txyvv12/rho(kv,j
3   v,1)
  byvv13 = deev3*ety(kv,jv,1)*muv1*gamma/pr
  byvv20 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvv20*gamma/pr+deev0
1   *ety(kv,jv,1)*muv2*gamma/pr+deev2*ety(kv,jv,1)*muv0*gamma/pr+rh
2   ov(kv,jv,1)*tyyvv20/rho(kv,jv,1)+rhov(kv,jv,1)*txyvv20/rho(kv,j
3   v,1)
  byvv21 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvv21*gamma/pr+deev1
1   *ety(kv,jv,1)*muv2*gamma/pr+deev2*ety(kv,jv,1)*muv1*gamma/pr+rh
2   ov(kv,jv,1)*tyyvv21/rho(kv,jv,1)+rhov(kv,jv,1)*txyvv21/rho(kv,j
3   v,1)
  byvv22 = (dez*zty(kv,jv,1)+dee*ety(kv,jv,1))*muvv22*gamma/pr+2*dee
1   v2*ety(kv,jv,1)*muv2*gamma/pr+rhov(kv,jv,1)*tyyvv22/rho(kv,jv,1
2   )+rhov(kv,jv,1)*txyvv22/rho(kv,jv,1)
  byvv23 = deev3*ety(kv,jv,1)*muv2*gamma/pr
  byvv30 = deev3*ety(kv,jv,1)*muv0*gamma/pr
  byvv31 = deev3*ety(kv,jv,1)*muv1*gamma/pr
  byvv32 = deev3*ety(kv,jv,1)*muv2*gamma/pr

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fp(0,0) = caud0*rho(kv,jv,1)/rdj(kv,jv)+cau/rdj(kv,jv)
fp(0,1) = caud1*rho(kv,jv,1)/rdj(kv,jv)
fp(0,2) = caud2*rho(kv,jv,1)/rdj(kv,jv)
fp(0,3) = 0
fp(1,0) = (-zty(kv,jv,1)*txyd0+ztx(kv,jv,1)*(pd0-txxd0)+caud0*rhou
1 (kv,jv,1))/rdj(kv,jv)
fp(1,1) = (-zty(kv,jv,1)*txyd1+ztx(kv,jv,1)*(pd1-txxd1)+caud1*rhou
1 (kv,jv,1)+cau)/rdj(kv,jv)
fp(1,2) = (-zty(kv,jv,1)*txyd2+ztx(kv,jv,1)*(pd2-txxd2)+caud2*rhou
1 (kv,jv,1))/rdj(kv,jv)
fp(1,3) = ztx(kv,jv,1)*pd3/rdj(kv,jv)
fp(2,0) = (zty(kv,jv,1)*(pd0-tyyd0)-ztx(kv,jv,1)*txyd0+caud0*rhov(
1 kv,jv,1))/rdj(kv,jv)
fp(2,1) = (zty(kv,jv,1)*(pd1-tyyd1)-ztx(kv,jv,1)*txyd1+caud1*rhov(
1 kv,jv,1))/rdj(kv,jv)
fp(2,2) = (zty(kv,jv,1)*(pd2-tyyd2)-ztx(kv,jv,1)*txyd2+caud2*rhov(
1 kv,jv,1)+cau)/rdj(kv,jv)
fp(2,3) = zty(kv,jv,1)*pd3/rdj(kv,jv)
fp(3,0) = (cau*pd0+caud0*(p+rhoe(kv,jv,1))-byd0*zty(kv,jv,1)-bxd0*
1 ztx(kv,jv,1))/rdj(kv,jv)
fp(3,1) = (cau*pd1+caud1*(p+rhoe(kv,jv,1))-byd1*zty(kv,jv,1)-bxd1*
1 ztx(kv,jv,1))/rdj(kv,jv)
fp(3,2) = (cau*pd2+caud2*(p+rhoe(kv,jv,1))-byd2*zty(kv,jv,1)-bxd2*
1 ztx(kv,jv,1))/rdj(kv,jv)
fp(3,3) = (cau*(pd3+1)-byd3*zty(kv,jv,1)-bxd3*ztx(kv,jv,1))/rdj(kv
1 ,jv)
fu(0,0) = 0
fu(0,1) = 0
fu(0,2) = 0
fu(0,3) = 0
fu(1,0) = (-zty(kv,jv,1)*txyu0-ztx(kv,jv,1)*txxu0)/rdj(kv,jv)
fu(1,1) = (-zty(kv,jv,1)*txyu1-ztx(kv,jv,1)*txxu1)/rdj(kv,jv)
fu(1,2) = (-zty(kv,jv,1)*txyu2-ztx(kv,jv,1)*txxu2)/rdj(kv,jv)
fu(1,3) = 0
fu(2,0) = (-zty(kv,jv,1)*tyyu0-ztx(kv,jv,1)*txyu0)/rdj(kv,jv)
fu(2,1) = (-zty(kv,jv,1)*tyyu1-ztx(kv,jv,1)*txyu1)/rdj(kv,jv)
fu(2,2) = (-zty(kv,jv,1)*tyyu2-ztx(kv,jv,1)*txyu2)/rdj(kv,jv)
fu(2,3) = 0
fu(3,0) = (-byu0*zty(kv,jv,1)-bxu0*ztx(kv,jv,1))/rdj(kv,jv)
fu(3,1) = (-byu1*zty(kv,jv,1)-bxu1*ztx(kv,jv,1))/rdj(kv,jv)
fu(3,2) = (-byu2*zty(kv,jv,1)-bxu2*ztx(kv,jv,1))/rdj(kv,jv)
fu(3,3) = (-byu3*zty(kv,jv,1)-bxu3*ztx(kv,jv,1))/rdj(kv,jv)
fv(0,0) = 0
fv(0,1) = 0
fv(0,2) = 0
fv(0,3) = 0
fv(1,0) = (-zty(kv,jv,1)*txyv0-ztx(kv,jv,1)*txxv0)/rdj(kv,jv)
fv(1,1) = (-zty(kv,jv,1)*txyv1-ztx(kv,jv,1)*txxv1)/rdj(kv,jv)
fv(1,2) = (-zty(kv,jv,1)*txyv2-ztx(kv,jv,1)*txxv2)/rdj(kv,jv)
fv(1,3) = 0
fv(2,0) = (-zty(kv,jv,1)*tyyv0-ztx(kv,jv,1)*txyv0)/rdj(kv,jv)
fv(2,1) = (-zty(kv,jv,1)*tyyv1-ztx(kv,jv,1)*txyv1)/rdj(kv,jv)
fv(2,2) = (-zty(kv,jv,1)*tyyv2-ztx(kv,jv,1)*txyv2)/rdj(kv,jv)
fv(2,3) = 0
fv(3,0) = (-byv0*zty(kv,jv,1)-bxv0*ztx(kv,jv,1))/rdj(kv,jv)
fv(3,1) = (-byv1*zty(kv,jv,1)-bxv1*ztx(kv,jv,1))/rdj(kv,jv)
fv(3,2) = (-byv2*zty(kv,jv,1)-bxv2*ztx(kv,jv,1))/rdj(kv,jv)

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fv(3,3) = (-byv3*sty(kv,jv,1)-bxv3*stx(kv,jv,1))/rdj(kv,jv)
fpp(0,0,0) = caudd00*rho(kv,jv,1)/rdj(kv,jv)+2*caud0/rdj(kv,jv)
fpp(0,0,1) = caudd01*rho(kv,jv,1)/rdj(kv,jv)+caud1/rdj(kv,jv)
fpp(0,0,2) = caudd02*rho(kv,jv,1)/rdj(kv,jv)+caud2/rdj(kv,jv)
fpp(0,0,3) = 0
fpp(0,1,0) = caudd10*rho(kv,jv,1)/rdj(kv,jv)+caud1/rdj(kv,jv)
fpp(0,1,1) = 0
fpp(0,1,2) = 0
fpp(0,1,3) = 0
fpp(0,2,0) = caudd20*rho(kv,jv,1)/rdj(kv,jv)+caud2/rdj(kv,jv)
fpp(0,2,1) = 0
fpp(0,2,2) = 0
fpp(0,2,3) = 0
fpp(0,3,0) = 0
fpp(0,3,1) = 0
fpp(0,3,2) = 0
fpp(0,3,3) = 0
fpp(1,0,0) = (-zty(kv,jv,1)*txydd00+ztx(kv,jv,1)*(pdd00-txxdd00)+c
1  audd00*rhou(kv,jv,1))/rdj(kv,jv)
fpp(1,0,1) = (-zty(kv,jv,1)*txydd01+ztx(kv,jv,1)*(pdd01-txxdd01)+c
1  audd01*rhou(kv,jv,1)+caud0)/rdj(kv,jv)
fpp(1,0,2) = (-zty(kv,jv,1)*txydd02+ztx(kv,jv,1)*(pdd02-txxdd02)+c
1  audd02*rhou(kv,jv,1))/rdj(kv,jv)
fpp(1,0,3) = 0
fpp(1,1,0) = (-zty(kv,jv,1)*txydd10+ztx(kv,jv,1)*(pdd10-txxdd10)+c
1  audd10*rhou(kv,jv,1)+caud0)/rdj(kv,jv)
fpp(1,1,1) = (ztx(kv,jv,1)*pdd11+2*caud1)/rdj(kv,jv)
fpp(1,1,2) = caud2/rdj(kv,jv)
fpp(1,1,3) = 0
fpp(1,2,0) = (-zty(kv,jv,1)*txydd20+ztx(kv,jv,1)*(pdd20-txxdd20)+c
1  audd20*rhou(kv,jv,1))/rdj(kv,jv)
fpp(1,2,1) = caud2/rdj(kv,jv)
fpp(1,2,2) = ztx(kv,jv,1)*pdd22/rdj(kv,jv)
fpp(1,2,3) = 0
fpp(1,3,0) = 0
fpp(1,3,1) = 0
fpp(1,3,2) = 0
fpp(1,3,3) = 0
fpp(2,0,0) = (zty(kv,jv,1)*(pdd00-tyydd00)-ztx(kv,jv,1)*txydd00+ca
1  udd00*rhov(kv,jv,1))/rdj(kv,jv)
fpp(2,0,1) = (zty(kv,jv,1)*(pdd01-tyydd01)-ztx(kv,jv,1)*txydd01+ca
1  udd01*rhov(kv,jv,1))/rdj(kv,jv)
fpp(2,0,2) = (zty(kv,jv,1)*(pdd02-tyydd02)-ztx(kv,jv,1)*txydd02+ca
1  udd02*rhov(kv,jv,1)+caud0)/rdj(kv,jv)
fpp(2,0,3) = 0
fpp(2,1,0) = (zty(kv,jv,1)*(pdd10-tyydd10)-ztx(kv,jv,1)*txydd10+ca
1  udd10*rhov(kv,jv,1))/rdj(kv,jv)
fpp(2,1,1) = zty(kv,jv,1)*pdd11/rdj(kv,jv)
fpp(2,1,2) = caud1/rdj(kv,jv)
fpp(2,1,3) = 0
fpp(2,2,0) = (zty(kv,jv,1)*(pdd20-tyydd20)-ztx(kv,jv,1)*txydd20+ca
1  udd20*rhov(kv,jv,1)+caud0)/rdj(kv,jv)
fpp(2,2,1) = caud1/rdj(kv,jv)
fpp(2,2,2) = (zty(kv,jv,1)*pdd22+2*caud2)/rdj(kv,jv)
fpp(2,2,3) = 0
fpp(2,3,0) = 0
fpp(2,3,1) = 0
fpp(2,3,2) = 0
fpp(2,3,3) = 0

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fpp(3,0,0) = (cau*pdd00+2*caud0*pd0+caudd00*(p+rhoe(kv,jv,1))-bydd
1 00*sty(kv,jv,1)-bxdd00*stx(kv,jv,1))/rdj(kv,jv)
fpp(3,0,1) = (cau*pdd01+caud0*pd1+caud1*pd0+caudd01*(p+rhoe(kv,jv,
1 1))-bydd01*sty(kv,jv,1)-bxdd01*stx(kv,jv,1))/rdj(kv,jv)
fpp(3,0,2) = (cau*pdd02+caud0*pd2+caud2*pd0+caudd02*(p+rhoe(kv,jv,
1 1))-bydd02*sty(kv,jv,1)-bxdd02*stx(kv,jv,1))/rdj(kv,jv)
fpp(3,0,3) = (caud0*(pd3+1)-bydd03*sty(kv,jv,1)-bxdd03*stx(kv,jv,1
1 ))/rdj(kv,jv)
fpp(3,1,0) = (cau*pdd10+caud0*pd1+caud1*pd0+caudd10*(p+rhoe(kv,jv,
1 1))-bydd10*sty(kv,jv,1)-bxdd10*stx(kv,jv,1))/rdj(kv,jv)
fpp(3,1,1) = (cau*pdd11+2*caud1*pd1-bydd11*sty(kv,jv,1)-bxdd11*stx
1 (kv,jv,1))/rdj(kv,jv)
fpp(3,1,2) = (caud1*pd2+caud2*pd1-bydd12*sty(kv,jv,1)-bxdd12*stx(k
1 v,jv,1))/rdj(kv,jv)
fpp(3,1,3) = caud1*(pd3+1)/rdj(kv,jv)
fpp(3,2,0) = (cau*pdd20+caud0*pd2+caud2*pd0+caudd20*(p+rhoe(kv,jv,
1 1))-bydd20*sty(kv,jv,1)-bxdd20*stx(kv,jv,1))/rdj(kv,jv)
fpp(3,2,1) = (caud1*pd2+caud2*pd1-bydd21*sty(kv,jv,1)-bxdd21*stx(k
1 v,jv,1))/rdj(kv,jv)
fpp(3,2,2) = (cau*pdd22+2*caud2*pd2-bydd22*sty(kv,jv,1)-bxdd22*stx
1 (kv,jv,1))/rdj(kv,jv)
fpp(3,2,3) = caud2*(pd3+1)/rdj(kv,jv)
fpp(3,3,0) = (caud0*(pd3+1)-bydd30*sty(kv,jv,1)-bxdd30*stx(kv,jv,1
1 ))/rdj(kv,jv)
fpp(3,3,1) = caud1*(pd3+1)/rdj(kv,jv)
fpp(3,3,2) = caud2*(pd3+1)/rdj(kv,jv)
fpp(3,3,3) = 0
fpu(0,0,0) = 0
fpu(0,0,1) = 0
fpu(0,0,2) = 0
fpu(0,0,3) = 0
fpu(0,1,0) = 0
fpu(0,1,1) = 0
fpu(0,1,2) = 0
fpu(0,1,3) = 0
fpu(0,2,0) = 0
fpu(0,2,1) = 0
fpu(0,2,2) = 0
fpu(0,2,3) = 0
fpu(0,3,0) = 0
fpu(0,3,1) = 0
fpu(0,3,2) = 0
fpu(0,3,3) = 0
fpu(1,0,0) = (-zty(kv,jv,1)*txydu00-ztx(kv,jv,1)*txxdu00)/rdj(kv,j
1 v)
fpu(1,0,1) = (-zty(kv,jv,1)*txydu01-ztx(kv,jv,1)*txxdu01)/rdj(kv,j
1 v)
fpu(1,0,2) = (-zty(kv,jv,1)*txydu02-ztx(kv,jv,1)*txxdu02)/rdj(kv,j
1 v)
fpu(1,0,3) = 0
fpu(1,1,0) = (-zty(kv,jv,1)*txydu10-ztx(kv,jv,1)*txxdu10)/rdj(kv,j
1 v)
fpu(1,1,1) = (-zty(kv,jv,1)*txydu11-ztx(kv,jv,1)*txxdu11)/rdj(kv,j
1 v)
fpu(1,1,2) = (-zty(kv,jv,1)*txydu12-ztx(kv,jv,1)*txxdu12)/rdj(kv,j
1 v)
fpu(1,1,3) = 0
fpu(1,2,0) = (-zty(kv,jv,1)*txydu20-ztx(kv,jv,1)*txxdu20)/rdj(kv,j
1 v)

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fpu(1,2,1) = (-zty(kv,jv,1)*txydu21-ztx(kv,jv,1)*txxdu21)/rdj(kv,j
1 v)
fpu(1,2,2) = (-zty(kv,jv,1)*txydu22-ztx(kv,jv,1)*txxdu22)/rdj(kv,j
1 v)
fpu(1,2,3) = 0
fpu(1,3,0) = 0
fpu(1,3,1) = 0
fpu(1,3,2) = 0
fpu(1,3,3) = 0
fpu(2,0,0) = (-zty(kv,jv,1)*tyydu00-ztx(kv,jv,1)*txydu00)/rdj(kv,j
1 v)
fpu(2,0,1) = (-zty(kv,jv,1)*tyydu01-ztx(kv,jv,1)*txydu01)/rdj(kv,j
1 v)
fpu(2,0,2) = (-zty(kv,jv,1)*tyydu02-ztx(kv,jv,1)*txydu02)/rdj(kv,j
1 v)
fpu(2,0,3) = 0
fpu(2,1,0) = (-zty(kv,jv,1)*tyydu10-ztx(kv,jv,1)*txydu10)/rdj(kv,j
1 v)
fpu(2,1,1) = (-zty(kv,jv,1)*tyydu11-ztx(kv,jv,1)*txydu11)/rdj(kv,j
1 v)
fpu(2,1,2) = (-zty(kv,jv,1)*tyydu12-ztx(kv,jv,1)*txydu12)/rdj(kv,j
1 v)
fpu(2,1,3) = 0
fpu(2,2,0) = (-zty(kv,jv,1)*tyydu20-ztx(kv,jv,1)*txydu20)/rdj(kv,j
1 v)
fpu(2,2,1) = (-zty(kv,jv,1)*tyydu21-ztx(kv,jv,1)*txydu21)/rdj(kv,j
1 v)
fpu(2,2,2) = (-zty(kv,jv,1)*tyydu22-ztx(kv,jv,1)*txydu22)/rdj(kv,j
1 v)
fpu(2,2,3) = 0
fpu(2,3,0) = 0
fpu(2,3,1) = 0
fpu(2,3,2) = 0
fpu(2,3,3) = 0
fpu(3,0,0) = (-bydu00*zty(kv,jv,1)-bxdu00*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,0,1) = (-bydu01*zty(kv,jv,1)-bxdu01*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,0,2) = (-bydu02*zty(kv,jv,1)-bxdu02*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,0,3) = (-bydu03*zty(kv,jv,1)-bxdu03*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,1,0) = (-bydu10*zty(kv,jv,1)-bxdu10*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,1,1) = (-bydu11*zty(kv,jv,1)-bxdu11*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,1,2) = (-bydu12*zty(kv,jv,1)-bxdu12*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,1,3) = 0
fpu(3,2,0) = (-bydu20*zty(kv,jv,1)-bxdu20*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,2,1) = (-bydu21*zty(kv,jv,1)-bxdu21*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,2,2) = (-bydu22*zty(kv,jv,1)-bxdu22*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,2,3) = 0
fpu(3,3,0) = (-bydu30*zty(kv,jv,1)-bxdu30*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,3,1) = (-bydu31*zty(kv,jv,1)-bxdu31*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,3,2) = (-bydu32*zty(kv,jv,1)-bxdu32*ztx(kv,jv,1))/rdj(kv,jv)
fpu(3,3,3) = 0
fpv(0,0,0) = 0
fpv(0,0,1) = 0
fpv(0,0,2) = 0
fpv(0,0,3) = 0
fpv(0,1,0) = 0
fpv(0,1,1) = 0
fpv(0,1,2) = 0
fpv(0,1,3) = 0
fpv(0,2,0) = 0

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fpv(0,2,1) = 0
fpv(0,2,2) = 0
fpv(0,2,3) = 0
fpv(0,3,0) = 0
fpv(0,3,1) = 0
fpv(0,3,2) = 0
fpv(0,3,3) = 0
fpv(1,0,0) = (-zty(kv,jv,1)*txydv00-ztx(kv,jv,1)*txxdv00)/rdj(kv,j
1 v)
fpv(1,0,1) = (-zty(kv,jv,1)*txydv01-ztx(kv,jv,1)*txxdv01)/rdj(kv,j
1 v)
fpv(1,0,2) = (-zty(kv,jv,1)*txydv02-ztx(kv,jv,1)*txxdv02)/rdj(kv,j
1 v)
fpv(1,0,3) = 0
fpv(1,1,0) = (-zty(kv,jv,1)*txydv10-ztx(kv,jv,1)*txxdv10)/rdj(kv,j
1 v)
fpv(1,1,1) = (-zty(kv,jv,1)*txydv11-ztx(kv,jv,1)*txxdv11)/rdj(kv,j
1 v)
fpv(1,1,2) = (-zty(kv,jv,1)*txydv12-ztx(kv,jv,1)*txxdv12)/rdj(kv,j
1 v)
fpv(1,1,3) = 0
fpv(1,2,0) = (-zty(kv,jv,1)*txydv20-ztx(kv,jv,1)*txxdv20)/rdj(kv,j
1 v)
fpv(1,2,1) = (-zty(kv,jv,1)*txydv21-ztx(kv,jv,1)*txxdv21)/rdj(kv,j
1 v)
fpv(1,2,2) = (-zty(kv,jv,1)*txydv22-ztx(kv,jv,1)*txxdv22)/rdj(kv,j
1 v)
fpv(1,2,3) = 0
fpv(1,3,0) = 0
fpv(1,3,1) = 0
fpv(1,3,2) = 0
fpv(1,3,3) = 0
fpv(2,0,0) = (-zty(kv,jv,1)*tyydv00-ztx(kv,jv,1)*txydv00)/rdj(kv,j
1 v)
fpv(2,0,1) = (-zty(kv,jv,1)*tyydv01-ztx(kv,jv,1)*txydv01)/rdj(kv,j
1 v)
fpv(2,0,2) = (-zty(kv,jv,1)*tyydv02-ztx(kv,jv,1)*txydv02)/rdj(kv,j
1 v)
fpv(2,0,3) = 0
fpv(2,1,0) = (-zty(kv,jv,1)*tyydv10-ztx(kv,jv,1)*txydv10)/rdj(kv,j
1 v)
fpv(2,1,1) = (-zty(kv,jv,1)*tyydv11-ztx(kv,jv,1)*txydv11)/rdj(kv,j
1 v)
fpv(2,1,2) = (-zty(kv,jv,1)*tyydv12-ztx(kv,jv,1)*txydv12)/rdj(kv,j
1 v)
fpv(2,1,3) = 0
fpv(2,2,0) = (-zty(kv,jv,1)*tyydv20-ztx(kv,jv,1)*txydv20)/rdj(kv,j
1 v)
fpv(2,2,1) = (-zty(kv,jv,1)*tyydv21-ztx(kv,jv,1)*txydv21)/rdj(kv,j
1 v)
fpv(2,2,2) = (-zty(kv,jv,1)*tyydv22-ztx(kv,jv,1)*txydv22)/rdj(kv,j
1 v)
fpv(2,2,3) = 0
fpv(2,3,0) = 0
fpv(2,3,1) = 0
fpv(2,3,2) = 0
fpv(2,3,3) = 0
fpv(3,0,0) = (-bydv00*zty(kv,jv,1)-bxdv00*ztx(kv,jv,1))/rdj(kv,jv)
fpv(3,0,1) = (-bydv01*zty(kv,jv,1)-bxdv01*ztx(kv,jv,1))/rdj(kv,jv)

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fpv(3,0,2) = (-bydv02*sty(kv,jv,1)-bxdv02*stx(kv,jv,1))/rdj(kv,jv)
fpv(3,0,3) = (-bydv03*sty(kv,jv,1)-bxdv03*stx(kv,jv,1))/rdj(kv,jv)
fpv(3,1,0) = (-bydv10*sty(kv,jv,1)-bxdv10*stx(kv,jv,1))/rdj(kv,jv)
fpv(3,1,1) = (-bydv11*sty(kv,jv,1)-bxdv11*stx(kv,jv,1))/rdj(kv,jv)
fpv(3,1,2) = (-bydv12*sty(kv,jv,1)-bxdv12*stx(kv,jv,1))/rdj(kv,jv)
fpv(3,1,3) = 0
fpv(3,2,0) = (-bydv20*sty(kv,jv,1)-bxdv20*stx(kv,jv,1))/rdj(kv,jv)
fpv(3,2,1) = (-bydv21*sty(kv,jv,1)-bxdv21*stx(kv,jv,1))/rdj(kv,jv)
fpv(3,2,2) = (-bydv22*sty(kv,jv,1)-bxdv22*stx(kv,jv,1))/rdj(kv,jv)
fpv(3,2,3) = 0
fpv(3,3,0) = (-bydv30*sty(kv,jv,1)-bxdv30*stx(kv,jv,1))/rdj(kv,jv)
fpv(3,3,1) = (-bydv31*sty(kv,jv,1)-bxdv31*stx(kv,jv,1))/rdj(kv,jv)
fpv(3,3,2) = (-bydv32*sty(kv,jv,1)-bxdv32*stx(kv,jv,1))/rdj(kv,jv)
fpv(3,3,3) = 0
fuu(0,0,0) = 0
fuu(0,0,1) = 0
fuu(0,0,2) = 0
fuu(0,0,3) = 0
fuu(0,1,0) = 0
fuu(0,1,1) = 0
fuu(0,1,2) = 0
fuu(0,1,3) = 0
fuu(0,2,0) = 0
fuu(0,2,1) = 0
fuu(0,2,2) = 0
fuu(0,2,3) = 0
fuu(0,3,0) = 0
fuu(0,3,1) = 0
fuu(0,3,2) = 0
fuu(0,3,3) = 0
fuu(1,0,0) = (-zty(kv,jv,1)*txyuu00-ztx(kv,jv,1)*txxuu00)/rdj(kv,j
1 v)
fuu(1,0,1) = (-zty(kv,jv,1)*txyuu01-ztx(kv,jv,1)*txxuu01)/rdj(kv,j
1 v)
fuu(1,0,2) = (-zty(kv,jv,1)*txyuu02-ztx(kv,jv,1)*txxuu02)/rdj(kv,j
1 v)
fuu(1,0,3) = 0
fuu(1,1,0) = (-zty(kv,jv,1)*txyuu10-ztx(kv,jv,1)*txxuu10)/rdj(kv,j
1 v)
fuu(1,1,1) = (-zty(kv,jv,1)*txyuu11-ztx(kv,jv,1)*txxuu11)/rdj(kv,j
1 v)
fuu(1,1,2) = (-zty(kv,jv,1)*txyuu12-ztx(kv,jv,1)*txxuu12)/rdj(kv,j
1 v)
fuu(1,1,3) = 0
fuu(1,2,0) = (-zty(kv,jv,1)*txyuu20-ztx(kv,jv,1)*txxuu20)/rdj(kv,j
1 v)
fuu(1,2,1) = (-zty(kv,jv,1)*txyuu21-ztx(kv,jv,1)*txxuu21)/rdj(kv,j
1 v)
fuu(1,2,2) = (-zty(kv,jv,1)*txyuu22-ztx(kv,jv,1)*txxuu22)/rdj(kv,j
1 v)
fuu(1,2,3) = 0
fuu(1,3,0) = 0
fuu(1,3,1) = 0
fuu(1,3,2) = 0
fuu(1,3,3) = 0
fuu(2,0,0) = (-zty(kv,jv,1)*tyyuu00-ztx(kv,jv,1)*txyuu00)/rdj(kv,j
1 v)
fuu(2,0,1) = (-zty(kv,jv,1)*tyyuu01-ztx(kv,jv,1)*txyuu01)/rdj(kv,j
1 v)

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fuu(2,0,2) = (-zty(kv,jv,1)*tyyuu02-ztx(kv,jv,1)*txyuu02)/rdj(kv,j
1 v)
fuu(2,0,3) = 0
fuu(2,1,0) = (-zty(kv,jv,1)*tyyuu10-ztx(kv,jv,1)*txyuu10)/rdj(kv,j
1 v)
fuu(2,1,1) = (-zty(kv,jv,1)*tyyuu11-ztx(kv,jv,1)*txyuu11)/rdj(kv,j
1 v)
fuu(2,1,2) = (-zty(kv,jv,1)*tyyuu12-ztx(kv,jv,1)*txyuu12)/rdj(kv,j
1 v)
fuu(2,1,3) = 0
fuu(2,2,0) = (-zty(kv,jv,1)*tyyuu20-ztx(kv,jv,1)*txyuu20)/rdj(kv,j
1 v)
fuu(2,2,1) = (-zty(kv,jv,1)*tyyuu21-ztx(kv,jv,1)*txyuu21)/rdj(kv,j
1 v)
fuu(2,2,2) = (-zty(kv,jv,1)*tyyuu22-ztx(kv,jv,1)*txyuu22)/rdj(kv,j
1 v)
fuu(2,2,3) = 0
fuu(2,3,0) = 0
fuu(2,3,1) = 0
fuu(2,3,2) = 0
fuu(2,3,3) = 0
fuu(3,0,0) = (-byuu00*zty(kv,jv,1)-bxuu00*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,0,1) = (-byuu01*zty(kv,jv,1)-bxuu01*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,0,2) = (-byuu02*zty(kv,jv,1)-bxuu02*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,0,3) = (-byuu03*zty(kv,jv,1)-bxuu03*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,1,0) = (-byuu10*zty(kv,jv,1)-bxuu10*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,1,1) = (-byuu11*zty(kv,jv,1)-bxuu11*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,1,2) = (-byuu12*zty(kv,jv,1)-bxuu12*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,1,3) = (-byuu13*zty(kv,jv,1)-bxuu13*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,2,0) = (-byuu20*zty(kv,jv,1)-bxuu20*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,2,1) = (-byuu21*zty(kv,jv,1)-bxuu21*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,2,2) = (-byuu22*zty(kv,jv,1)-bxuu22*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,2,3) = (-byuu23*zty(kv,jv,1)-bxuu23*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,3,0) = (-byuu30*zty(kv,jv,1)-bxuu30*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,3,1) = (-byuu31*zty(kv,jv,1)-bxuu31*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,3,2) = (-byuu32*zty(kv,jv,1)-bxuu32*ztx(kv,jv,1))/rdj(kv,jv)
fuu(3,3,3) = 0
fuv(0,0,0) = 0
fuv(0,0,1) = 0
fuv(0,0,2) = 0
fuv(0,0,3) = 0
fuv(0,1,0) = 0
fuv(0,1,1) = 0
fuv(0,1,2) = 0
fuv(0,1,3) = 0
fuv(0,2,0) = 0
fuv(0,2,1) = 0
fuv(0,2,2) = 0
fuv(0,2,3) = 0
fuv(0,3,0) = 0
fuv(0,3,1) = 0
fuv(0,3,2) = 0
fuv(0,3,3) = 0
fuv(1,0,0) = (-zty(kv,jv,1)*txyuv00-ztx(kv,jv,1)*txxuv00)/rdj(kv,j
1 v)
fuv(1,0,1) = (-zty(kv,jv,1)*txyuv01-ztx(kv,jv,1)*txxuv01)/rdj(kv,j
1 v)
fuv(1,0,2) = (-zty(kv,jv,1)*txyuv02-ztx(kv,jv,1)*txxuv02)/rdj(kv,j
1 v)

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fuv(1,0,3) = 0
fuv(1,1,0) = (-zty(kv,jv,1)*txyuv10-ztx(kv,jv,1)*txxuv10)/rdj(kv,j
1 v)
fuv(1,1,1) = (-zty(kv,jv,1)*txyuv11-ztx(kv,jv,1)*txxuv11)/rdj(kv,j
1 v)
fuv(1,1,2) = (-zty(kv,jv,1)*txyuv12-ztx(kv,jv,1)*txxuv12)/rdj(kv,j
1 v)
fuv(1,1,3) = 0
fuv(1,2,0) = (-zty(kv,jv,1)*txyuv20-ztx(kv,jv,1)*txxuv20)/rdj(kv,j
1 v)
fuv(1,2,1) = (-zty(kv,jv,1)*txyuv21-ztx(kv,jv,1)*txxuv21)/rdj(kv,j
1 v)
fuv(1,2,2) = (-zty(kv,jv,1)*txyuv22-ztx(kv,jv,1)*txxuv22)/rdj(kv,j
1 v)
fuv(1,2,3) = 0
fuv(1,3,0) = 0
fuv(1,3,1) = 0
fuv(1,3,2) = 0
fuv(1,3,3) = 0
fuv(2,0,0) = (-zty(kv,jv,1)*tyyuv00-ztx(kv,jv,1)*txyuv00)/rdj(kv,j
1 v)
fuv(2,0,1) = (-zty(kv,jv,1)*tyyuv01-ztx(kv,jv,1)*txyuv01)/rdj(kv,j
1 v)
fuv(2,0,2) = (-zty(kv,jv,1)*tyyuv02-ztx(kv,jv,1)*txyuv02)/rdj(kv,j
1 v)
fuv(2,0,3) = 0
fuv(2,1,0) = (-zty(kv,jv,1)*tyyuv10-ztx(kv,jv,1)*txyuv10)/rdj(kv,j
1 v)
fuv(2,1,1) = (-zty(kv,jv,1)*tyyuv11-ztx(kv,jv,1)*txyuv11)/rdj(kv,j
1 v)
fuv(2,1,2) = (-zty(kv,jv,1)*tyyuv12-ztx(kv,jv,1)*txyuv12)/rdj(kv,j
1 v)
fuv(2,1,3) = 0
fuv(2,2,0) = (-zty(kv,jv,1)*tyyuv20-ztx(kv,jv,1)*txyuv20)/rdj(kv,j
1 v)
fuv(2,2,1) = (-zty(kv,jv,1)*tyyuv21-ztx(kv,jv,1)*txyuv21)/rdj(kv,j
1 v)
fuv(2,2,2) = (-zty(kv,jv,1)*tyyuv22-ztx(kv,jv,1)*txyuv22)/rdj(kv,j
1 v)
fuv(2,2,3) = 0
fuv(2,3,0) = 0
fuv(2,3,1) = 0
fuv(2,3,2) = 0
fuv(2,3,3) = 0
fuv(3,0,0) = (-byuv00*zty(kv,jv,1)-bxuv00*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,0,1) = (-byuv01*zty(kv,jv,1)-bxuv01*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,0,2) = (-byuv02*zty(kv,jv,1)-bxuv02*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,0,3) = (-byuv03*zty(kv,jv,1)-bxuv03*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,1,0) = (-byuv10*zty(kv,jv,1)-bxuv10*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,1,1) = (-byuv11*zty(kv,jv,1)-bxuv11*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,1,2) = (-byuv12*zty(kv,jv,1)-bxuv12*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,1,3) = (-byuv13*zty(kv,jv,1)-bxuv13*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,2,0) = (-byuv20*zty(kv,jv,1)-bxuv20*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,2,1) = (-byuv21*zty(kv,jv,1)-bxuv21*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,2,2) = (-byuv22*zty(kv,jv,1)-bxuv22*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,2,3) = (-byuv23*zty(kv,jv,1)-bxuv23*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,3,0) = (-byuv30*zty(kv,jv,1)-bxuv30*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,3,1) = (-byuv31*zty(kv,jv,1)-bxuv31*ztx(kv,jv,1))/rdj(kv,jv)
fuv(3,3,2) = (-byuv32*zty(kv,jv,1)-bxuv32*ztx(kv,jv,1))/rdj(kv,jv)

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fuv(3,3,3) = 0
fvp(0,0,0) = 0
fvp(0,0,1) = 0
fvp(0,0,2) = 0
fvp(0,0,3) = 0
fvp(0,1,0) = 0
fvp(0,1,1) = 0
fvp(0,1,2) = 0
fvp(0,1,3) = 0
fvp(0,2,0) = 0
fvp(0,2,1) = 0
fvp(0,2,2) = 0
fvp(0,2,3) = 0
fvp(0,3,0) = 0
fvp(0,3,1) = 0
fvp(0,3,2) = 0
fvp(0,3,3) = 0
fvp(1,0,0) = (-zty(kv,jv,1)*txyvd00-ztx(kv,jv,1)*txxvd00)/rdj(kv,j
1 v)
fvp(1,0,1) = (-zty(kv,jv,1)*txyvd01-ztx(kv,jv,1)*txxvd01)/rdj(kv,j
1 v)
fvp(1,0,2) = (-zty(kv,jv,1)*txyvd02-ztx(kv,jv,1)*txxvd02)/rdj(kv,j
1 v)
fvp(1,0,3) = 0
fvp(1,1,0) = (-zty(kv,jv,1)*txyvd10-ztx(kv,jv,1)*txxvd10)/rdj(kv,j
1 v)
fvp(1,1,1) = (-zty(kv,jv,1)*txyvd11-ztx(kv,jv,1)*txxvd11)/rdj(kv,j
1 v)
fvp(1,1,2) = (-zty(kv,jv,1)*txyvd12-ztx(kv,jv,1)*txxvd12)/rdj(kv,j
1 v)
fvp(1,1,3) = 0
fvp(1,2,0) = (-zty(kv,jv,1)*txyvd20-ztx(kv,jv,1)*txxvd20)/rdj(kv,j
1 v)
fvp(1,2,1) = (-zty(kv,jv,1)*txyvd21-ztx(kv,jv,1)*txxvd21)/rdj(kv,j
1 v)
fvp(1,2,2) = (-zty(kv,jv,1)*txyvd22-ztx(kv,jv,1)*txxvd22)/rdj(kv,j
1 v)
fvp(1,2,3) = 0
fvp(1,3,0) = 0
fvp(1,3,1) = 0
fvp(1,3,2) = 0
fvp(1,3,3) = 0
fvp(2,0,0) = (-zty(kv,jv,1)*tyyvd00-ztx(kv,jv,1)*txyvd00)/rdj(kv,j
1 v)
fvp(2,0,1) = (-zty(kv,jv,1)*tyyvd01-ztx(kv,jv,1)*txyvd01)/rdj(kv,j
1 v)
fvp(2,0,2) = (-zty(kv,jv,1)*tyyvd02-ztx(kv,jv,1)*txyvd02)/rdj(kv,j
1 v)
fvp(2,0,3) = 0
fvp(2,1,0) = (-zty(kv,jv,1)*tyyvd10-ztx(kv,jv,1)*txyvd10)/rdj(kv,j
1 v)
fvp(2,1,1) = (-zty(kv,jv,1)*tyyvd11-ztx(kv,jv,1)*txyvd11)/rdj(kv,j
1 v)
fvp(2,1,2) = (-zty(kv,jv,1)*tyyvd12-ztx(kv,jv,1)*txyvd12)/rdj(kv,j
1 v)
fvp(2,1,3) = 0
fvp(2,2,0) = (-zty(kv,jv,1)*tyyvd20-ztx(kv,jv,1)*txyvd20)/rdj(kv,j
1 v)
fvp(2,2,1) = (-zty(kv,jv,1)*tyyvd21-ztx(kv,jv,1)*txyvd21)/rdj(kv,j

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1  v)
fvp(2,2,2) = (-zty(kv,jv,1)*tyyvd22-ztx(kv,jv,1)*txyvd22)/rdj(kv,j
1  v)
fvp(2,2,3) = 0
fvp(2,3,0) = 0
fvp(2,3,1) = 0
fvp(2,3,2) = 0
fvp(2,3,3) = 0
fvp(3,0,0) = (-byvd00*zty(kv,jv,1)-bxvd00*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,0,1) = (-byvd01*zty(kv,jv,1)-bxvd01*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,0,2) = (-byvd02*zty(kv,jv,1)-bxvd02*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,0,3) = (-byvd03*zty(kv,jv,1)-bxvd03*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,1,0) = (-byvd10*zty(kv,jv,1)-bxvd10*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,1,1) = (-byvd11*zty(kv,jv,1)-bxvd11*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,1,2) = (-byvd12*zty(kv,jv,1)-bxvd12*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,1,3) = (-byvd13*zty(kv,jv,1)-bxvd13*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,2,0) = (-byvd20*zty(kv,jv,1)-bxvd20*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,2,1) = (-byvd21*zty(kv,jv,1)-bxvd21*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,2,2) = (-byvd22*zty(kv,jv,1)-bxvd22*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,2,3) = (-byvd23*zty(kv,jv,1)-bxvd23*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,3,0) = (-byvd30*zty(kv,jv,1)-bxvd30*ztx(kv,jv,1))/rdj(kv,jv)
fvp(3,3,1) = 0
fvp(3,3,2) = 0
fvp(3,3,3) = 0
fvu(0,0,0) = 0
fvu(0,0,1) = 0
fvu(0,0,2) = 0
fvu(0,0,3) = 0
fvu(0,1,0) = 0
fvu(0,1,1) = 0
fvu(0,1,2) = 0
fvu(0,1,3) = 0
fvu(0,2,0) = 0
fvu(0,2,1) = 0
fvu(0,2,2) = 0
fvu(0,2,3) = 0
fvu(0,3,0) = 0
fvu(0,3,1) = 0
fvu(0,3,2) = 0
fvu(0,3,3) = 0
fvu(1,0,0) = (-zty(kv,jv,1)*txyvuo00-ztx(kv,jv,1)*txxvu00)/rdj(kv,j
1  v)
fvu(1,0,1) = (-zty(kv,jv,1)*txyvuo01-ztx(kv,jv,1)*txxvu01)/rdj(kv,j
1  v)
fvu(1,0,2) = (-zty(kv,jv,1)*txyvuo02-ztx(kv,jv,1)*txxvu02)/rdj(kv,j
1  v)
fvu(1,0,3) = 0
fvu(1,1,0) = (-zty(kv,jv,1)*txyvul0-ztx(kv,jv,1)*txxvul0)/rdj(kv,j
1  v)
fvu(1,1,1) = (-zty(kv,jv,1)*txyvul1-ztx(kv,jv,1)*txxvul1)/rdj(kv,j
1  v)
fvu(1,1,2) = (-zty(kv,jv,1)*txyvul2-ztx(kv,jv,1)*txxvul2)/rdj(kv,j
1  v)
fvu(1,1,3) = 0
fvu(1,2,0) = (-zty(kv,jv,1)*txyvuo20-ztx(kv,jv,1)*txxvu20)/rdj(kv,j
1  v)
fvu(1,2,1) = (-zty(kv,jv,1)*txyvuo21-ztx(kv,jv,1)*txxvu21)/rdj(kv,j
1  v)
fvu(1,2,2) = (-zty(kv,jv,1)*txyvuo22-ztx(kv,jv,1)*txxvu22)/rdj(kv,j

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```

1  v)
fvu(1,2,3) = 0
fvu(1,3,0) = 0
fvu(1,3,1) = 0
fvu(1,3,2) = 0
fvu(1,3,3) = 0
fvu(2,0,0) = (-zty(kv,jv,1)*tyyvuu00-ztx(kv,jv,1)*txyvuu00)/rdj(kv,j
1  v)
fvu(2,0,1) = (-zty(kv,jv,1)*tyyvuu01-ztx(kv,jv,1)*txyvuu01)/rdj(kv,j
1  v)
fvu(2,0,2) = (-zty(kv,jv,1)*tyyvuu02-ztx(kv,jv,1)*txyvuu02)/rdj(kv,j
1  v)
fvu(2,0,3) = 0
fvu(2,1,0) = (-zty(kv,jv,1)*tyyvuu10-ztx(kv,jv,1)*txyvuu10)/rdj(kv,j
1  v)
fvu(2,1,1) = (-zty(kv,jv,1)*tyyvuu11-ztx(kv,jv,1)*txyvuu11)/rdj(kv,j
1  v)
fvu(2,1,2) = (-zty(kv,jv,1)*tyyvuu12-ztx(kv,jv,1)*txyvuu12)/rdj(kv,j
1  v)
fvu(2,1,3) = 0
fvu(2,2,0) = (-zty(kv,jv,1)*tyyvuu20-ztx(kv,jv,1)*txyvuu20)/rdj(kv,j
1  v)
fvu(2,2,1) = (-zty(kv,jv,1)*tyyvuu21-ztx(kv,jv,1)*txyvuu21)/rdj(kv,j
1  v)
fvu(2,2,2) = (-zty(kv,jv,1)*tyyvuu22-ztx(kv,jv,1)*txyvuu22)/rdj(kv,j
1  v)
fvu(2,2,3) = 0
fvu(2,3,0) = 0
fvu(2,3,1) = 0
fvu(2,3,2) = 0
fvu(2,3,3) = 0
fvu(3,0,0) = (-byvu00*zty(kv,jv,1)-bxvu00*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,0,1) = (-byvu01*zty(kv,jv,1)-bxvu01*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,0,2) = (-byvu02*zty(kv,jv,1)-bxvu02*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,0,3) = (-byvu03*zty(kv,jv,1)-bxvu03*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,1,0) = (-byvu10*zty(kv,jv,1)-bxvu10*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,1,1) = (-byvu11*zty(kv,jv,1)-bxvu11*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,1,2) = (-byvu12*zty(kv,jv,1)-bxvu12*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,1,3) = (-byvu13*zty(kv,jv,1)-bxvu13*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,2,0) = (-byvu20*zty(kv,jv,1)-bxvu20*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,2,1) = (-byvu21*zty(kv,jv,1)-bxvu21*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,2,2) = (-byvu22*zty(kv,jv,1)-bxvu22*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,2,3) = (-byvu23*zty(kv,jv,1)-bxvu23*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,3,0) = (-byvu30*zty(kv,jv,1)-bxvu30*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,3,1) = (-byvu31*zty(kv,jv,1)-bxvu31*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,3,2) = (-byvu32*zty(kv,jv,1)-bxvu32*ztx(kv,jv,1))/rdj(kv,jv)
fvu(3,3,3) = 0
fvv(0,0,0) = 0
fvv(0,0,1) = 0
fvv(0,0,2) = 0
fvv(0,0,3) = 0
fvv(0,1,0) = 0
fvv(0,1,1) = 0
fvv(0,1,2) = 0
fvv(0,1,3) = 0
fvv(0,2,0) = 0
fvv(0,2,1) = 0
fvv(0,2,2) = 0
fvv(0,2,3) = 0

```

```

fvv(0,3,0) = 0
fvv(0,3,1) = 0
fvv(0,3,2) = 0
fvv(0,3,3) = 0
fvv(1,0,0) = (-zty(kv,jv,1)*txyvv00-ztx(kv,jv,1)*txxvv00)/rdj(kv,j
1 v)
fvv(1,0,1) = (-zty(kv,jv,1)*txyvv01-ztx(kv,jv,1)*txxvv01)/rdj(kv,j
1 v)
fvv(1,0,2) = (-zty(kv,jv,1)*txyvv02-ztx(kv,jv,1)*txxvv02)/rdj(kv,j
1 v)
fvv(1,0,3) = 0
fvv(1,1,0) = (-zty(kv,jv,1)*txyvv10-ztx(kv,jv,1)*txxvv10)/rdj(kv,j
1 v)
fvv(1,1,1) = (-zty(kv,jv,1)*txyvv11-ztx(kv,jv,1)*txxvv11)/rdj(kv,j
1 v)
fvv(1,1,2) = (-zty(kv,jv,1)*txyvv12-ztx(kv,jv,1)*txxvv12)/rdj(kv,j
1 v)
fvv(1,1,3) = 0
fvv(1,2,0) = (-zty(kv,jv,1)*txyvv20-ztx(kv,jv,1)*txxvv20)/rdj(kv,j
1 v)
fvv(1,2,1) = (-zty(kv,jv,1)*txyvv21-ztx(kv,jv,1)*txxvv21)/rdj(kv,j
1 v)
fvv(1,2,2) = (-zty(kv,jv,1)*txyvv22-ztx(kv,jv,1)*txxvv22)/rdj(kv,j
1 v)
fvv(1,2,3) = 0
fvv(1,3,0) = 0
fvv(1,3,1) = 0
fvv(1,3,2) = 0
fvv(1,3,3) = 0
fvv(2,0,0) = (-zty(kv,jv,1)*tyyvv00-ztx(kv,jv,1)*txyvv00)/rdj(kv,j
1 v)
fvv(2,0,1) = (-zty(kv,jv,1)*tyyvv01-ztx(kv,jv,1)*txyvv01)/rdj(kv,j
1 v)
fvv(2,0,2) = (-zty(kv,jv,1)*tyyvv02-ztx(kv,jv,1)*txyvv02)/rdj(kv,j
1 v)
fvv(2,0,3) = 0
fvv(2,1,0) = (-zty(kv,jv,1)*tyyvv10-ztx(kv,jv,1)*txyvv10)/rdj(kv,j
1 v)
fvv(2,1,1) = (-zty(kv,jv,1)*tyyvv11-ztx(kv,jv,1)*txyvv11)/rdj(kv,j
1 v)
fvv(2,1,2) = (-zty(kv,jv,1)*tyyvv12-ztx(kv,jv,1)*txyvv12)/rdj(kv,j
1 v)
fvv(2,1,3) = 0
fvv(2,2,0) = (-zty(kv,jv,1)*tyyvv20-ztx(kv,jv,1)*txyvv20)/rdj(kv,j
1 v)
fvv(2,2,1) = (-zty(kv,jv,1)*tyyvv21-ztx(kv,jv,1)*txyvv21)/rdj(kv,j
1 v)
fvv(2,2,2) = (-zty(kv,jv,1)*tyyvv22-ztx(kv,jv,1)*txyvv22)/rdj(kv,j
1 v)
fvv(2,2,3) = 0
fvv(2,3,0) = 0
fvv(2,3,1) = 0
fvv(2,3,2) = 0
fvv(2,3,3) = 0
fvv(3,0,0) = (-byvv00*zty(kv,jv,1)-bxvv00*ztx(kv,jv,1))/rdj(kv,jv)
fvv(3,0,1) = (-byvv01*zty(kv,jv,1)-bxvv01*ztx(kv,jv,1))/rdj(kv,jv)
fvv(3,0,2) = (-byvv02*zty(kv,jv,1)-bxvv02*ztx(kv,jv,1))/rdj(kv,jv)
fvv(3,0,3) = (-byvv03*zty(kv,jv,1)-bxvv03*ztx(kv,jv,1))/rdj(kv,jv)
fvv(3,1,0) = (-byvv10*zty(kv,jv,1)-bxvv10*ztx(kv,jv,1))/rdj(kv,jv)

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fvv(3,1,1) = (-byvv11*sty(kv,jv,1)-bxvv11*stx(kv,jv,1))/rdj(kv,jv)
fvv(3,1,2) = (-byvv12*sty(kv,jv,1)-bxvv12*stx(kv,jv,1))/rdj(kv,jv)
fvv(3,1,3) = (-byvv13*sty(kv,jv,1)-bxvv13*stx(kv,jv,1))/rdj(kv,jv)
fvv(3,2,0) = (-byvv20*sty(kv,jv,1)-bxvv20*stx(kv,jv,1))/rdj(kv,jv)
fvv(3,2,1) = (-byvv21*sty(kv,jv,1)-bxvv21*stx(kv,jv,1))/rdj(kv,jv)
fvv(3,2,2) = (-byvv22*sty(kv,jv,1)-bxvv22*stx(kv,jv,1))/rdj(kv,jv)
fvv(3,2,3) = (-byvv23*sty(kv,jv,1)-bxvv23*stx(kv,jv,1))/rdj(kv,jv)
fvv(3,3,0) = (-byvv30*sty(kv,jv,1)-bxvv30*stx(kv,jv,1))/rdj(kv,jv)
fvv(3,3,1) = (-byvv31*sty(kv,jv,1)-bxvv31*stx(kv,jv,1))/rdj(kv,jv)
fvv(3,3,2) = (-byvv32*sty(kv,jv,1)-bxvv32*stx(kv,jv,1))/rdj(kv,jv)
fvv(3,3,3) = 0

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gp(0,0) = cavd0*rho(kv,jv,1)/rdj(kv,jv)+cav/rdj(kv,jv)
gp(0,1) = cavd1*rho(kv,jv,1)/rdj(kv,jv)
gp(0,2) = cavd2*rho(kv,jv,1)/rdj(kv,jv)
gp(0,3) = 0
gp(1,0) = (-ety(kv,jv,1)*txyd0+etx(kv,jv,1)*(pd0-txxd0)+cavd0*rhou
1 (kv,jv,1))/rdj(kv,jv)
gp(1,1) = (-ety(kv,jv,1)*txyd1+etx(kv,jv,1)*(pd1-txxd1)+cavd1*rhou
1 (kv,jv,1)+cav)/rdj(kv,jv)
gp(1,2) = (-ety(kv,jv,1)*txyd2+etx(kv,jv,1)*(pd2-txxd2)+cavd2*rhou
1 (kv,jv,1))/rdj(kv,jv)
gp(1,3) = etx(kv,jv,1)*pd3/rdj(kv,jv)
gp(2,0) = (ety(kv,jv,1)*(pd0-tyyd0)-etx(kv,jv,1)*txyd0+cavd0*rhov(
1 kv,jv,1))/rdj(kv,jv)
gp(2,1) = (ety(kv,jv,1)*(pd1-tyyd1)-etx(kv,jv,1)*txyd1+cavd1*rhov(
1 kv,jv,1))/rdj(kv,jv)
gp(2,2) = (ety(kv,jv,1)*(pd2-tyyd2)-etx(kv,jv,1)*txyd2+cavd2*rhov(
1 kv,jv,1)+cav)/rdj(kv,jv)
gp(2,3) = ety(kv,jv,1)*pd3/rdj(kv,jv)
gp(3,0) = (cav*pd0+cavd0*(p+rhoe(kv,jv,1))-byd0*ety(kv,jv,1)-bxld0*
1 etx(kv,jv,1))/rdj(kv,jv)
gp(3,1) = (cav*pd1+cavd1*(p+rhoe(kv,jv,1))-byd1*ety(kv,jv,1)-bxld1*
1 etx(kv,jv,1))/rdj(kv,jv)
gp(3,2) = (cav*pd2+cavd2*(p+rhoe(kv,jv,1))-byd2*ety(kv,jv,1)-bxld2*
1 etx(kv,jv,1))/rdj(kv,jv)
gp(3,3) = (cav*(pd3+1)-byd3*ety(kv,jv,1)-bxld3*etx(kv,jv,1))/rdj(kv
1 ,jv)
gu(0,0) = 0
gu(0,1) = 0
gu(0,2) = 0
gu(0,3) = 0
gu(1,0) = (-ety(kv,jv,1)*txyu0-etx(kv,jv,1)*txxu0)/rdj(kv,jv)
gu(1,1) = (-ety(kv,jv,1)*txyu1-etx(kv,jv,1)*txxu1)/rdj(kv,jv)
gu(1,2) = (-ety(kv,jv,1)*txyu2-etx(kv,jv,1)*txxu2)/rdj(kv,jv)
gu(1,3) = 0
gu(2,0) = (-ety(kv,jv,1)*tyyu0-etx(kv,jv,1)*txyu0)/rdj(kv,jv)
gu(2,1) = (-ety(kv,jv,1)*tyyu1-etx(kv,jv,1)*txyu1)/rdj(kv,jv)
gu(2,2) = (-ety(kv,jv,1)*tyyu2-etx(kv,jv,1)*txyu2)/rdj(kv,jv)
gu(2,3) = 0
gu(3,0) = (-byu0*ety(kv,jv,1)-bxu0*etx(kv,jv,1))/rdj(kv,jv)
gu(3,1) = (-byu1*ety(kv,jv,1)-bxu1*etx(kv,jv,1))/rdj(kv,jv)
gu(3,2) = (-byu2*ety(kv,jv,1)-bxu2*etx(kv,jv,1))/rdj(kv,jv)
gu(3,3) = (-byu3*ety(kv,jv,1)-bxu3*etx(kv,jv,1))/rdj(kv,jv)
gv(0,0) = 0
gv(0,1) = 0
gv(0,2) = 0

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gv(0,3) = 0
gv(1,0) = (-ety(kv,jv,1)*txyv0-etx(kv,jv,1)*txxv0)/rdj(kv,jv)
gv(1,1) = (-ety(kv,jv,1)*txyv1-etx(kv,jv,1)*txxv1)/rdj(kv,jv)
gv(1,2) = (-ety(kv,jv,1)*txyv2-etx(kv,jv,1)*txxv2)/rdj(kv,jv)
gv(1,3) = 0
gv(2,0) = (-ety(kv,jv,1)*tyyv0-etx(kv,jv,1)*txyv0)/rdj(kv,jv)
gv(2,1) = (-ety(kv,jv,1)*tyyv1-etx(kv,jv,1)*txyv1)/rdj(kv,jv)
gv(2,2) = (-ety(kv,jv,1)*tyyv2-etx(kv,jv,1)*txyv2)/rdj(kv,jv)
gv(2,3) = 0
gv(3,0) = (-byv0*ety(kv,jv,1)-bxv0*etx(kv,jv,1))/rdj(kv,jv)
gv(3,1) = (-byv1*ety(kv,jv,1)-bxv1*etx(kv,jv,1))/rdj(kv,jv)
gv(3,2) = (-byv2*ety(kv,jv,1)-bxv2*etx(kv,jv,1))/rdj(kv,jv)
gv(3,3) = (-byv3*ety(kv,jv,1)-bxv3*etx(kv,jv,1))/rdj(kv,jv)
gpp(0,0,0) = cavdd00*rho(kv,jv,1)/rdj(kv,jv)+2*cavd0/rdj(kv,jv)
gpp(0,0,1) = cavdd01*rho(kv,jv,1)/rdj(kv,jv)+cavd1/rdj(kv,jv)
gpp(0,0,2) = cavdd02*rho(kv,jv,1)/rdj(kv,jv)+cavd2/rdj(kv,jv)
gpp(0,0,3) = 0
gpp(0,1,0) = cavdd10*rho(kv,jv,1)/rdj(kv,jv)+cavd1/rdj(kv,jv)
gpp(0,1,1) = 0
gpp(0,1,2) = 0
gpp(0,1,3) = 0
gpp(0,2,0) = cavdd20*rho(kv,jv,1)/rdj(kv,jv)+cavd2/rdj(kv,jv)
gpp(0,2,1) = 0
gpp(0,2,2) = 0
gpp(0,2,3) = 0
gpp(0,3,0) = 0
gpp(0,3,1) = 0
gpp(0,3,2) = 0
gpp(0,3,3) = 0
gpp(1,0,0) = (-ety(kv,jv,1)*txydd00+etx(kv,jv,1)*(pdd00-txxdd00)+c
1 avdd00*rhou(kv,jv,1))/rdj(kv,jv)
gpp(1,0,1) = (-ety(kv,jv,1)*txydd01+etx(kv,jv,1)*(pdd01-txxdd01)+c
1 avdd01*rhou(kv,jv,1)+cavd0)/rdj(kv,jv)
gpp(1,0,2) = (-ety(kv,jv,1)*txydd02+etx(kv,jv,1)*(pdd02-txxdd02)+c
1 avdd02*rhou(kv,jv,1))/rdj(kv,jv)
gpp(1,0,3) = 0
gpp(1,1,0) = (-ety(kv,jv,1)*txydd10+etx(kv,jv,1)*(pdd10-txxdd10)+c
1 avdd10*rhou(kv,jv,1)+cavd0)/rdj(kv,jv)
gpp(1,1,1) = (etx(kv,jv,1)*pdd11+2*cavd1)/rdj(kv,jv)
gpp(1,1,2) = cavd2/rdj(kv,jv)
gpp(1,1,3) = 0
gpp(1,2,0) = (-ety(kv,jv,1)*txydd20+etx(kv,jv,1)*(pdd20-txxdd20)+c
1 avdd20*rhou(kv,jv,1))/rdj(kv,jv)
gpp(1,2,1) = cavd2/rdj(kv,jv)
gpp(1,2,2) = etx(kv,jv,1)*pdd22/rdj(kv,jv)
gpp(1,2,3) = 0
gpp(1,3,0) = 0
gpp(1,3,1) = 0
gpp(1,3,2) = 0
gpp(1,3,3) = 0
gpp(2,0,0) = (ety(kv,jv,1)*(pdd00-tyydd00)-etx(kv,jv,1)*txydd00+ca
1 vdd00*rhov(kv,jv,1))/rdj(kv,jv)
gpp(2,0,1) = (ety(kv,jv,1)*(pdd01-tyydd01)-etx(kv,jv,1)*txydd01+ca
1 vdd01*rhov(kv,jv,1))/rdj(kv,jv)
gpp(2,0,2) = (ety(kv,jv,1)*(pdd02-tyydd02)-etx(kv,jv,1)*txydd02+ca
1 vdd02*rhov(kv,jv,1)+cavd0)/rdj(kv,jv)
gpp(2,0,3) = 0
gpp(2,1,0) = (ety(kv,jv,1)*(pdd10-tyydd10)-etx(kv,jv,1)*txydd10+ca
1 vdd10*rhov(kv,jv,1))/rdj(kv,jv)

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gpp(2,1,1) = ety(kv,jv,1)*pdd11/rdj(kv,jv)
gpp(2,1,2) = cavd1/rdj(kv,jv)
gpp(2,1,3) = 0
gpp(2,2,0) = (ety(kv,jv,1)*(pdd20-tyydd20)-etx(kv,jv,1)*txydd20+ca
1 vdd20+rhov(kv,jv,1)+cavd0)/rdj(kv,jv)
gpp(2,2,1) = cavd1/rdj(kv,jv)
gpp(2,2,2) = (ety(kv,jv,1)*pdd22+2*cavd2)/rdj(kv,jv)
gpp(2,2,3) = 0
gpp(2,3,0) = 0
gpp(2,3,1) = 0
gpp(2,3,2) = 0
gpp(2,3,3) = 0
gpp(3,0,0) = (cav*pdd00+2*cavd0*pd0+cavdd00*(p+rhoe(kv,jv,1))-bydd
1 00*ety(kv,jv,1)-bxdd00*etx(kv,jv,1))/rdj(kv,jv)
gpp(3,0,1) = (cav*pdd01+cavd0*pd1+cavd1*pd0+cavdd01*(p+rhoe(kv,jv,
1 1))-bydd01*ety(kv,jv,1)-bxdd01*etx(kv,jv,1))/rdj(kv,jv)
gpp(3,0,2) = (cav*pdd02+cavd0*pd2+cavd2*pd0+cavdd02*(p+rhoe(kv,jv,
1 1))-bydd02*ety(kv,jv,1)-bxdd02*etx(kv,jv,1))/rdj(kv,jv)
gpp(3,0,3) = (cavd0*(pd3+1)-bydd03*ety(kv,jv,1)-bxdd03*etx(kv,jv,1
1 ))/rdj(kv,jv)
gpp(3,1,0) = (cav*pdd10+cavd0*pd1+cavd1*pd0+cavdd10*(p+rhoe(kv,jv,
1 1))-bydd10*ety(kv,jv,1)-bxdd10*etx(kv,jv,1))/rdj(kv,jv)
gpp(3,1,1) = (cav*pdd11+2*cavd1*pd1-bydd11*ety(kv,jv,1)-bxdd11*etx
1 (kv,jv,1))/rdj(kv,jv)
gpp(3,1,2) = (cavd1*pd2+cavd2*pd1-bydd12*ety(kv,jv,1)-bxdd12*etx(k
1 v,jv,1))/rdj(kv,jv)
gpp(3,1,3) = cavd1*(pd3+1)/rdj(kv,jv)
gpp(3,2,0) = (cav*pdd20+cavd0*pd2+cavd2*pd0+cavdd20*(p+rhoe(kv,jv,
1 1))-bydd20*ety(kv,jv,1)-bxdd20*etx(kv,jv,1))/rdj(kv,jv)
gpp(3,2,1) = (cavd1*pd2+cavd2*pd1-bydd21*ety(kv,jv,1)-bxdd21*etx(k
1 v,jv,1))/rdj(kv,jv)
gpp(3,2,2) = (cav*pdd22+2*cavd2*pd2-bydd22*ety(kv,jv,1)-bxdd22*etx
1 (kv,jv,1))/rdj(kv,jv)
gpp(3,2,3) = cavd2*(pd3+1)/rdj(kv,jv)
gpp(3,3,0) = (cavd0*(pd3+1)-bydd30*ety(kv,jv,1)-bxdd30*etx(kv,jv,1
1 ))/rdj(kv,jv)
gpp(3,3,1) = cavd1*(pd3+1)/rdj(kv,jv)
gpp(3,3,2) = cavd2*(pd3+1)/rdj(kv,jv)
gpp(3,3,3) = 0
gpu(0,0,0) = 0
gpu(0,0,1) = 0
gpu(0,0,2) = 0
gpu(0,0,3) = 0
gpu(0,1,0) = 0
gpu(0,1,1) = 0
gpu(0,1,2) = 0
gpu(0,1,3) = 0
gpu(0,2,0) = 0
gpu(0,2,1) = 0
gpu(0,2,2) = 0
gpu(0,2,3) = 0
gpu(0,3,0) = 0
gpu(0,3,1) = 0
gpu(0,3,2) = 0
gpu(0,3,3) = 0
gpu(1,0,0) = (-ety(kv,jv,1)*txydu00-etx(kv,jv,1)*txxdu00)/rdj(kv,j
1 v)
gpu(1,0,1) = (-ety(kv,jv,1)*txydu01-etx(kv,jv,1)*txxdu01)/rdj(kv,j
1 v)

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gpu(1,0,2) = (-ety(kv,jv,1)*txydu02-etx(kv,jv,1)*txxdu02)/rdj(kv,j
1 v)
gpu(1,0,3) = 0
gpu(1,1,0) = (-ety(kv,jv,1)*txydu10-etx(kv,jv,1)*txxdu10)/rdj(kv,j
1 v)
gpu(1,1,1) = (-ety(kv,jv,1)*txydu11-etx(kv,jv,1)*txxdu11)/rdj(kv,j
1 v)
gpu(1,1,2) = (-ety(kv,jv,1)*txydu12-etx(kv,jv,1)*txxdu12)/rdj(kv,j
1 v)
gpu(1,1,3) = 0
gpu(1,2,0) = (-ety(kv,jv,1)*txydu20-etx(kv,jv,1)*txxdu20)/rdj(kv,j
1 v)
gpu(1,2,1) = (-ety(kv,jv,1)*txydu21-etx(kv,jv,1)*txxdu21)/rdj(kv,j
1 v)
gpu(1,2,2) = (-ety(kv,jv,1)*txydu22-etx(kv,jv,1)*txxdu22)/rdj(kv,j
1 v)
gpu(1,2,3) = 0
gpu(1,3,0) = 0
gpu(1,3,1) = 0
gpu(1,3,2) = 0
gpu(1,3,3) = 0
gpu(2,0,0) = (-ety(kv,jv,1)*tyydu00-etx(kv,jv,1)*txydu00)/rdj(kv,j
1 v)
gpu(2,0,1) = (-ety(kv,jv,1)*tyydu01-etx(kv,jv,1)*txydu01)/rdj(kv,j
1 v)
gpu(2,0,2) = (-ety(kv,jv,1)*tyydu02-etx(kv,jv,1)*txydu02)/rdj(kv,j
1 v)
gpu(2,0,3) = 0
gpu(2,1,0) = (-ety(kv,jv,1)*tyydu10-etx(kv,jv,1)*txydu10)/rdj(kv,j
1 v)
gpu(2,1,1) = (-ety(kv,jv,1)*tyydu11-etx(kv,jv,1)*txydu11)/rdj(kv,j
1 v)
gpu(2,1,2) = (-ety(kv,jv,1)*tyydu12-etx(kv,jv,1)*txydu12)/rdj(kv,j
1 v)
gpu(2,1,3) = 0
gpu(2,2,0) = (-ety(kv,jv,1)*tyydu20-etx(kv,jv,1)*txydu20)/rdj(kv,j
1 v)
gpu(2,2,1) = (-ety(kv,jv,1)*tyydu21-etx(kv,jv,1)*txydu21)/rdj(kv,j
1 v)
gpu(2,2,2) = (-ety(kv,jv,1)*tyydu22-etx(kv,jv,1)*txydu22)/rdj(kv,j
1 v)
gpu(2,2,3) = 0
gpu(2,3,0) = 0
gpu(2,3,1) = 0
gpu(2,3,2) = 0
gpu(2,3,3) = 0
gpu(3,0,0) = (-bydu00*ety(kv,jv,1)-bxdu00*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,0,1) = (-bydu01*ety(kv,jv,1)-bxdu01*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,0,2) = (-bydu02*ety(kv,jv,1)-bxdu02*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,0,3) = (-bydu03*ety(kv,jv,1)-bxdu03*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,1,0) = (-bydu10*ety(kv,jv,1)-bxdu10*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,1,1) = (-bydu11*ety(kv,jv,1)-bxdu11*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,1,2) = (-bydu12*ety(kv,jv,1)-bxdu12*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,1,3) = 0
gpu(3,2,0) = (-bydu20*ety(kv,jv,1)-bxdu20*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,2,1) = (-bydu21*ety(kv,jv,1)-bxdu21*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,2,2) = (-bydu22*ety(kv,jv,1)-bxdu22*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,2,3) = 0
gpu(3,3,0) = (-bydu30*ety(kv,jv,1)-bxdu30*etx(kv,jv,1))/rdj(kv,jv)

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gpu(3,3,1) = (-bydu31*ety(kv,jv,1)-bxdu31*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,3,2) = (-bydu32*ety(kv,jv,1)-bxdu32*etx(kv,jv,1))/rdj(kv,jv)
gpu(3,3,3) = 0
gpv(0,0,0) = 0
gpv(0,0,1) = 0
gpv(0,0,2) = 0
gpv(0,0,3) = 0
gpv(0,1,0) = 0
gpv(0,1,1) = 0
gpv(0,1,2) = 0
gpv(0,1,3) = 0
gpv(0,2,0) = 0
gpv(0,2,1) = 0
gpv(0,2,2) = 0
gpv(0,2,3) = 0
gpv(0,3,0) = 0
gpv(0,3,1) = 0
gpv(0,3,2) = 0
gpv(0,3,3) = 0
gpv(1,0,0) = (-ety(kv,jv,1)*txydv00-etx(kv,jv,1)*txxdv00)/rdj(kv,j
1 v)
gpv(1,0,1) = (-ety(kv,jv,1)*txydv01-etx(kv,jv,1)*txxdv01)/rdj(kv,j
1 v)
gpv(1,0,2) = (-ety(kv,jv,1)*txydv02-etx(kv,jv,1)*txxdv02)/rdj(kv,j
1 v)
gpv(1,0,3) = 0
gpv(1,1,0) = (-ety(kv,jv,1)*txydv10-etx(kv,jv,1)*txxdv10)/rdj(kv,j
1 v)
gpv(1,1,1) = (-ety(kv,jv,1)*txydv11-etx(kv,jv,1)*txxdv11)/rdj(kv,j
1 v)
gpv(1,1,2) = (-ety(kv,jv,1)*txydv12-etx(kv,jv,1)*txxdv12)/rdj(kv,j
1 v)
gpv(1,1,3) = 0
gpv(1,2,0) = (-ety(kv,jv,1)*txydv20-etx(kv,jv,1)*txxdv20)/rdj(kv,j
1 v)
gpv(1,2,1) = (-ety(kv,jv,1)*txydv21-etx(kv,jv,1)*txxdv21)/rdj(kv,j
1 v)
gpv(1,2,2) = (-ety(kv,jv,1)*txydv22-etx(kv,jv,1)*txxdv22)/rdj(kv,j
1 v)
gpv(1,2,3) = 0
gpv(1,3,0) = 0
gpv(1,3,1) = 0
gpv(1,3,2) = 0
gpv(1,3,3) = 0
gpv(2,0,0) = (-ety(kv,jv,1)*tyydv00-etx(kv,jv,1)*txydv00)/rdj(kv,j
1 v)
gpv(2,0,1) = (-ety(kv,jv,1)*tyydv01-etx(kv,jv,1)*txydv01)/rdj(kv,j
1 v)
gpv(2,0,2) = (-ety(kv,jv,1)*tyydv02-etx(kv,jv,1)*txydv02)/rdj(kv,j
1 v)
gpv(2,0,3) = 0
gpv(2,1,0) = (-ety(kv,jv,1)*tyydv10-etx(kv,jv,1)*txydv10)/rdj(kv,j
1 v)
gpv(2,1,1) = (-ety(kv,jv,1)*tyydv11-etx(kv,jv,1)*txydv11)/rdj(kv,j
1 v)
gpv(2,1,2) = (-ety(kv,jv,1)*tyydv12-etx(kv,jv,1)*txydv12)/rdj(kv,j
1 v)
gpv(2,1,3) = 0
gpv(2,2,0) = (-ety(kv,jv,1)*tyydv20-etx(kv,jv,1)*txydv20)/rdj(kv,j

```

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1  v)
gpv(2,2,1) = (-ety(kv,jv,1)*tyydv21-etx(kv,jv,1)*txydv21)/rdj(kv,j
1  v)
gpv(2,2,2) = (-ety(kv,jv,1)*tyydv22-etx(kv,jv,1)*txydv22)/rdj(kv,j
1  v)
gpv(2,2,3) = 0
gpv(2,3,0) = 0
gpv(2,3,1) = 0
gpv(2,3,2) = 0
gpv(2,3,3) = 0
gpv(3,0,0) = (-bydv00*ety(kv,jv,1)-bxdv00*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,0,1) = (-bydv01*ety(kv,jv,1)-bxdv01*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,0,2) = (-bydv02*ety(kv,jv,1)-bxdv02*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,0,3) = (-bydv03*ety(kv,jv,1)-bxdv03*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,1,0) = (-bydv10*ety(kv,jv,1)-bxdv10*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,1,1) = (-bydv11*ety(kv,jv,1)-bxdv11*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,1,2) = (-bydv12*ety(kv,jv,1)-bxdv12*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,1,3) = 0
gpv(3,2,0) = (-bydv20*ety(kv,jv,1)-bxdv20*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,2,1) = (-bydv21*ety(kv,jv,1)-bxdv21*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,2,2) = (-bydv22*ety(kv,jv,1)-bxdv22*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,2,3) = 0
gpv(3,3,0) = (-bydv30*ety(kv,jv,1)-bxdv30*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,3,1) = (-bydv31*ety(kv,jv,1)-bxdv31*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,3,2) = (-bydv32*ety(kv,jv,1)-bxdv32*etx(kv,jv,1))/rdj(kv,jv)
gpv(3,3,3) = 0
guu(0,0,0) = 0
guu(0,0,1) = 0
guu(0,0,2) = 0
guu(0,0,3) = 0
guu(0,1,0) = 0
guu(0,1,1) = 0
guu(0,1,2) = 0
guu(0,1,3) = 0
guu(0,2,0) = 0
guu(0,2,1) = 0
guu(0,2,2) = 0
guu(0,2,3) = 0
guu(0,3,0) = 0
guu(0,3,1) = 0
guu(0,3,2) = 0
guu(0,3,3) = 0
guu(1,0,0) = (-ety(kv,jv,1)*txyuu00-etx(kv,jv,1)*txxuu00)/rdj(kv,j
1  v)
guu(1,0,1) = (-ety(kv,jv,1)*txyuu01-etx(kv,jv,1)*txxuu01)/rdj(kv,j
1  v)
guu(1,0,2) = (-ety(kv,jv,1)*txyuu02-etx(kv,jv,1)*txxuu02)/rdj(kv,j
1  v)
guu(1,0,3) = 0
guu(1,1,0) = (-ety(kv,jv,1)*txyuu10-etx(kv,jv,1)*txxuu10)/rdj(kv,j
1  v)
guu(1,1,1) = (-ety(kv,jv,1)*txyuu11-etx(kv,jv,1)*txxuu11)/rdj(kv,j
1  v)
guu(1,1,2) = (-ety(kv,jv,1)*txyuu12-etx(kv,jv,1)*txxuu12)/rdj(kv,j
1  v)
guu(1,1,3) = 0
guu(1,2,0) = (-ety(kv,jv,1)*txyuu20-etx(kv,jv,1)*txxuu20)/rdj(kv,j
1  v)
guu(1,2,1) = (-ety(kv,jv,1)*txyuu21-etx(kv,jv,1)*txxuu21)/rdj(kv,j

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1  v)
guu(1,2,2) = (-ety(kv,jv,1)*txyuu22-etx(kv,jv,1)*txxuu22)/rdj(kv,j
1  v)
guu(1,2,3) = 0
guu(1,3,0) = 0
guu(1,3,1) = 0
guu(1,3,2) = 0
guu(1,3,3) = 0
guu(2,0,0) = (-ety(kv,jv,1)*tyyuu00-etx(kv,jv,1)*txyuu00)/rdj(kv,j
1  v)
guu(2,0,1) = (-ety(kv,jv,1)*tyyuu01-etx(kv,jv,1)*txyuu01)/rdj(kv,j
1  v)
guu(2,0,2) = (-ety(kv,jv,1)*tyyuu02-etx(kv,jv,1)*txyuu02)/rdj(kv,j
1  v)
guu(2,0,3) = 0
guu(2,1,0) = (-ety(kv,jv,1)*tyyuu10-etx(kv,jv,1)*txyuu10)/rdj(kv,j
1  v)
guu(2,1,1) = (-ety(kv,jv,1)*tyyuu11-etx(kv,jv,1)*txyuu11)/rdj(kv,j
1  v)
guu(2,1,2) = (-ety(kv,jv,1)*tyyuu12-etx(kv,jv,1)*txyuu12)/rdj(kv,j
1  v)
guu(2,1,3) = 0
guu(2,2,0) = (-ety(kv,jv,1)*tyyuu20-etx(kv,jv,1)*txyuu20)/rdj(kv,j
1  v)
guu(2,2,1) = (-ety(kv,jv,1)*tyyuu21-etx(kv,jv,1)*txyuu21)/rdj(kv,j
1  v)
guu(2,2,2) = (-ety(kv,jv,1)*tyyuu22-etx(kv,jv,1)*txyuu22)/rdj(kv,j
1  v)
guu(2,2,3) = 0
guu(2,3,0) = 0
guu(2,3,1) = 0
guu(2,3,2) = 0
guu(2,3,3) = 0
guu(3,0,0) = (-byuu00*ety(kv,jv,1)-bxuu00*etx(kv,jv,1))/rdj(kv,jv)
guu(3,0,1) = (-byuu01*ety(kv,jv,1)-bxuu01*etx(kv,jv,1))/rdj(kv,jv)
guu(3,0,2) = (-byuu02*ety(kv,jv,1)-bxuu02*etx(kv,jv,1))/rdj(kv,jv)
guu(3,0,3) = (-byuu03*ety(kv,jv,1)-bxuu03*etx(kv,jv,1))/rdj(kv,jv)
guu(3,1,0) = (-byuu10*ety(kv,jv,1)-bxuu10*etx(kv,jv,1))/rdj(kv,jv)
guu(3,1,1) = (-byuu11*ety(kv,jv,1)-bxuu11*etx(kv,jv,1))/rdj(kv,jv)
guu(3,1,2) = (-byuu12*ety(kv,jv,1)-bxuu12*etx(kv,jv,1))/rdj(kv,jv)
guu(3,1,3) = (-byuu13*ety(kv,jv,1)-bxuu13*etx(kv,jv,1))/rdj(kv,jv)
guu(3,2,0) = (-byuu20*ety(kv,jv,1)-bxuu20*etx(kv,jv,1))/rdj(kv,jv)
guu(3,2,1) = (-byuu21*ety(kv,jv,1)-bxuu21*etx(kv,jv,1))/rdj(kv,jv)
guu(3,2,2) = (-byuu22*ety(kv,jv,1)-bxuu22*etx(kv,jv,1))/rdj(kv,jv)
guu(3,2,3) = (-byuu23*ety(kv,jv,1)-bxuu23*etx(kv,jv,1))/rdj(kv,jv)
guu(3,3,0) = (-byuu30*ety(kv,jv,1)-bxuu30*etx(kv,jv,1))/rdj(kv,jv)
guu(3,3,1) = (-byuu31*ety(kv,jv,1)-bxuu31*etx(kv,jv,1))/rdj(kv,jv)
guu(3,3,2) = (-byuu32*ety(kv,jv,1)-bxuu32*etx(kv,jv,1))/rdj(kv,jv)
guu(3,3,3) = 0
guv(0,0,0) = 0
guv(0,0,1) = 0
guv(0,0,2) = 0
guv(0,0,3) = 0
guv(0,1,0) = 0
guv(0,1,1) = 0
guv(0,1,2) = 0
guv(0,1,3) = 0
guv(0,2,0) = 0
guv(0,2,1) = 0

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guv(0,2,2) = 0
guv(0,2,3) = 0
guv(0,3,0) = 0
guv(0,3,1) = 0
guv(0,3,2) = 0
guv(0,3,3) = 0
guv(1,0,0) = (-ety(kv,jv,1)*txyuv00-etx(kv,jv,1)*txxuv00)/rdj(kv,j
1 v)
guv(1,0,1) = (-ety(kv,jv,1)*txyuv01-etx(kv,jv,1)*txxuv01)/rdj(kv,j
1 v)
guv(1,0,2) = (-ety(kv,jv,1)*txyuv02-etx(kv,jv,1)*txxuv02)/rdj(kv,j
1 v)
guv(1,0,3) = 0
guv(1,1,0) = (-ety(kv,jv,1)*txyuv10-etx(kv,jv,1)*txxuv10)/rdj(kv,j
1 v)
guv(1,1,1) = (-ety(kv,jv,1)*txyuv11-etx(kv,jv,1)*txxuv11)/rdj(kv,j
1 v)
guv(1,1,2) = (-ety(kv,jv,1)*txyuv12-etx(kv,jv,1)*txxuv12)/rdj(kv,j
1 v)
guv(1,1,3) = 0
guv(1,2,0) = (-ety(kv,jv,1)*txyuv20-etx(kv,jv,1)*txxuv20)/rdj(kv,j
1 v)
guv(1,2,1) = (-ety(kv,jv,1)*txyuv21-etx(kv,jv,1)*txxuv21)/rdj(kv,j
1 v)
guv(1,2,2) = (-ety(kv,jv,1)*txyuv22-etx(kv,jv,1)*txxuv22)/rdj(kv,j
1 v)
guv(1,2,3) = 0
guv(1,3,0) = 0
guv(1,3,1) = 0
guv(1,3,2) = 0
guv(1,3,3) = 0
guv(2,0,0) = (-ety(kv,jv,1)*tyyuv00-etx(kv,jv,1)*txyuv00)/rdj(kv,j
1 v)
guv(2,0,1) = (-ety(kv,jv,1)*tyyuv01-etx(kv,jv,1)*txyuv01)/rdj(kv,j
1 v)
guv(2,0,2) = (-ety(kv,jv,1)*tyyuv02-etx(kv,jv,1)*txyuv02)/rdj(kv,j
1 v)
guv(2,0,3) = 0
guv(2,1,0) = (-ety(kv,jv,1)*tyyuv10-etx(kv,jv,1)*txyuv10)/rdj(kv,j
1 v)
guv(2,1,1) = (-ety(kv,jv,1)*tyyuv11-etx(kv,jv,1)*txyuv11)/rdj(kv,j
1 v)
guv(2,1,2) = (-ety(kv,jv,1)*tyyuv12-etx(kv,jv,1)*txyuv12)/rdj(kv,j
1 v)
guv(2,1,3) = 0
guv(2,2,0) = (-ety(kv,jv,1)*tyyuv20-etx(kv,jv,1)*txyuv20)/rdj(kv,j
1 v)
guv(2,2,1) = (-ety(kv,jv,1)*tyyuv21-etx(kv,jv,1)*txyuv21)/rdj(kv,j
1 v)
guv(2,2,2) = (-ety(kv,jv,1)*tyyuv22-etx(kv,jv,1)*txyuv22)/rdj(kv,j
1 v)
guv(2,2,3) = 0
guv(2,3,0) = 0
guv(2,3,1) = 0
guv(2,3,2) = 0
guv(2,3,3) = 0
guv(3,0,0) = (-byuv00*ety(kv,jv,1)-bxuv00*etx(kv,jv,1))/rdj(kv,jv)
guv(3,0,1) = (-byuv01*ety(kv,jv,1)-bxuv01*etx(kv,jv,1))/rdj(kv,jv)
guv(3,0,2) = (-byuv02*ety(kv,jv,1)-bxuv02*etx(kv,jv,1))/rdj(kv,jv)

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guv(3,0,3) = (-byuv03*ety(kv,jv,1)-bxuv03*etx(kv,jv,1))/rdj(kv,jv)
guv(3,1,0) = (-byuv10*ety(kv,jv,1)-bxuv10*etx(kv,jv,1))/rdj(kv,jv)
guv(3,1,1) = (-byuv11*ety(kv,jv,1)-bxuv11*etx(kv,jv,1))/rdj(kv,jv)
guv(3,1,2) = (-byuv12*ety(kv,jv,1)-bxuv12*etx(kv,jv,1))/rdj(kv,jv)
guv(3,1,3) = (-byuv13*ety(kv,jv,1)-bxuv13*etx(kv,jv,1))/rdj(kv,jv)
guv(3,2,0) = (-byuv20*ety(kv,jv,1)-bxuv20*etx(kv,jv,1))/rdj(kv,jv)
guv(3,2,1) = (-byuv21*ety(kv,jv,1)-bxuv21*etx(kv,jv,1))/rdj(kv,jv)
guv(3,2,2) = (-byuv22*ety(kv,jv,1)-bxuv22*etx(kv,jv,1))/rdj(kv,jv)
guv(3,2,3) = (-byuv23*ety(kv,jv,1)-bxuv23*etx(kv,jv,1))/rdj(kv,jv)
guv(3,3,0) = (-byuv30*ety(kv,jv,1)-bxuv30*etx(kv,jv,1))/rdj(kv,jv)
guv(3,3,1) = (-byuv31*ety(kv,jv,1)-bxuv31*etx(kv,jv,1))/rdj(kv,jv)
guv(3,3,2) = (-byuv32*ety(kv,jv,1)-bxuv32*etx(kv,jv,1))/rdj(kv,jv)
guv(3,3,3) = 0
gvp(0,0,0) = 0
gvp(0,0,1) = 0
gvp(0,0,2) = 0
gvp(0,0,3) = 0
gvp(0,1,0) = 0
gvp(0,1,1) = 0
gvp(0,1,2) = 0
gvp(0,1,3) = 0
gvp(0,2,0) = 0
gvp(0,2,1) = 0
gvp(0,2,2) = 0
gvp(0,2,3) = 0
gvp(0,3,0) = 0
gvp(0,3,1) = 0
gvp(0,3,2) = 0
gvp(0,3,3) = 0
gvp(1,0,0) = (-ety(kv,jv,1)*txyvd00-etx(kv,jv,1)*txxvd00)/rdj(kv,j
1 v)
gvp(1,0,1) = (-ety(kv,jv,1)*txyvd01-etx(kv,jv,1)*txxvd01)/rdj(kv,j
1 v)
gvp(1,0,2) = (-ety(kv,jv,1)*txyvd02-etx(kv,jv,1)*txxvd02)/rdj(kv,j
1 v)
gvp(1,0,3) = 0
gvp(1,1,0) = (-ety(kv,jv,1)*txyvd10-etx(kv,jv,1)*txxvd10)/rdj(kv,j
1 v)
gvp(1,1,1) = (-ety(kv,jv,1)*txyvd11-etx(kv,jv,1)*txxvd11)/rdj(kv,j
1 v)
gvp(1,1,2) = (-ety(kv,jv,1)*txyvd12-etx(kv,jv,1)*txxvd12)/rdj(kv,j
1 v)
gvp(1,1,3) = 0
gvp(1,2,0) = (-ety(kv,jv,1)*txyvd20-etx(kv,jv,1)*txxvd20)/rdj(kv,j
1 v)
gvp(1,2,1) = (-ety(kv,jv,1)*txyvd21-etx(kv,jv,1)*txxvd21)/rdj(kv,j
1 v)
gvp(1,2,2) = (-ety(kv,jv,1)*txyvd22-etx(kv,jv,1)*txxvd22)/rdj(kv,j
1 v)
gvp(1,2,3) = 0
gvp(1,3,0) = 0
gvp(1,3,1) = 0
gvp(1,3,2) = 0
gvp(1,3,3) = 0
gvp(2,0,0) = (-ety(kv,jv,1)*tyyvd00-etx(kv,jv,1)*txyvd00)/rdj(kv,j
1 v)
gvp(2,0,1) = (-ety(kv,jv,1)*tyyvd01-etx(kv,jv,1)*txyvd01)/rdj(kv,j
1 v)
gvp(2,0,2) = (-ety(kv,jv,1)*tyyvd02-etx(kv,jv,1)*txyvd02)/rdj(kv,j

```

```

1  v)
gvp(2,0,3) = 0
gvp(2,1,0) = (-ety(kv,jv,1)*tyyvd10-etx(kv,jv,1)*txyvd10)/rdj(kv,j
1  v)
gvp(2,1,1) = (-ety(kv,jv,1)*tyyvd11-etx(kv,jv,1)*txyvd11)/rdj(kv,j
1  v)
gvp(2,1,2) = (-ety(kv,jv,1)*tyyvd12-etx(kv,jv,1)*txyvd12)/rdj(kv,j
1  v)
gvp(2,1,3) = 0
gvp(2,2,0) = (-ety(kv,jv,1)*tyyvd20-etx(kv,jv,1)*txyvd20)/rdj(kv,j
1  v)
gvp(2,2,1) = (-ety(kv,jv,1)*tyyvd21-etx(kv,jv,1)*txyvd21)/rdj(kv,j
1  v)
gvp(2,2,2) = (-ety(kv,jv,1)*tyyvd22-etx(kv,jv,1)*txyvd22)/rdj(kv,j
1  v)
gvp(2,2,3) = 0
gvp(2,3,0) = 0
gvp(2,3,1) = 0
gvp(2,3,2) = 0
gvp(2,3,3) = 0
gvp(3,0,0) = (-byvd00*ety(kv,jv,1)-bxvd00*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,0,1) = (-byvd01*ety(kv,jv,1)-bxvd01*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,0,2) = (-byvd02*ety(kv,jv,1)-bxvd02*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,0,3) = (-byvd03*ety(kv,jv,1)-bxvd03*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,1,0) = (-byvd10*ety(kv,jv,1)-bxvd10*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,1,1) = (-byvd11*ety(kv,jv,1)-bxvd11*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,1,2) = (-byvd12*ety(kv,jv,1)-bxvd12*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,1,3) = (-byvd13*ety(kv,jv,1)-bxvd13*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,2,0) = (-byvd20*ety(kv,jv,1)-bxvd20*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,2,1) = (-byvd21*ety(kv,jv,1)-bxvd21*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,2,2) = (-byvd22*ety(kv,jv,1)-bxvd22*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,2,3) = (-byvd23*ety(kv,jv,1)-bxvd23*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,3,0) = (-byvd30*ety(kv,jv,1)-bxvd30*etx(kv,jv,1))/rdj(kv,jv)
gvp(3,3,1) = 0
gvp(3,3,2) = 0
gvp(3,3,3) = 0
gvu(0,0,0) = 0
gvu(0,0,1) = 0
gvu(0,0,2) = 0
gvu(0,0,3) = 0
gvu(0,1,0) = 0
gvu(0,1,1) = 0
gvu(0,1,2) = 0
gvu(0,1,3) = 0
gvu(0,2,0) = 0
gvu(0,2,1) = 0
gvu(0,2,2) = 0
gvu(0,2,3) = 0
gvu(0,3,0) = 0
gvu(0,3,1) = 0
gvu(0,3,2) = 0
gvu(0,3,3) = 0
gvu(1,0,0) = (-ety(kv,jv,1)*txyvuu00-etx(kv,jv,1)*txxvu00)/rdj(kv,j
1  v)
gvu(1,0,1) = (-ety(kv,jv,1)*txyvuu01-etx(kv,jv,1)*txxvu01)/rdj(kv,j
1  v)
gvu(1,0,2) = (-ety(kv,jv,1)*txyvuu02-etx(kv,jv,1)*txxvu02)/rdj(kv,j
1  v)
gvu(1,0,3) = 0

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gvu(1,1,0) = (-ety(kv,jv,1)*txyvul0-etx(kv,jv,1)*txxvu10)/rdj(kv,j
1 v)
gvu(1,1,1) = (-ety(kv,jv,1)*txyvul1-etx(kv,jv,1)*txxvu11)/rdj(kv,j
1 v)
gvu(1,1,2) = (-ety(kv,jv,1)*txyvul2-etx(kv,jv,1)*txxvu12)/rdj(kv,j
1 v)
gvu(1,1,3) = 0
gvu(1,2,0) = (-ety(kv,jv,1)*txyvul20-etx(kv,jv,1)*txxvu20)/rdj(kv,j
1 v)
gvu(1,2,1) = (-ety(kv,jv,1)*txyvul21-etx(kv,jv,1)*txxvu21)/rdj(kv,j
1 v)
gvu(1,2,2) = (-ety(kv,jv,1)*txyvul22-etx(kv,jv,1)*txxvu22)/rdj(kv,j
1 v)
gvu(1,2,3) = 0
gvu(1,3,0) = 0
gvu(1,3,1) = 0
gvu(1,3,2) = 0
gvu(1,3,3) = 0
gvu(2,0,0) = (-ety(kv,jv,1)*tyyvul00-etx(kv,jv,1)*txyvul00)/rdj(kv,j
1 v)
gvu(2,0,1) = (-ety(kv,jv,1)*tyyvul01-etx(kv,jv,1)*txyvul01)/rdj(kv,j
1 v)
gvu(2,0,2) = (-ety(kv,jv,1)*tyyvul02-etx(kv,jv,1)*txyvul02)/rdj(kv,j
1 v)
gvu(2,0,3) = 0
gvu(2,1,0) = (-ety(kv,jv,1)*tyyvul10-etx(kv,jv,1)*txyvul10)/rdj(kv,j
1 v)
gvu(2,1,1) = (-ety(kv,jv,1)*tyyvul11-etx(kv,jv,1)*txyvul11)/rdj(kv,j
1 v)
gvu(2,1,2) = (-ety(kv,jv,1)*tyyvul12-etx(kv,jv,1)*txyvul12)/rdj(kv,j
1 v)
gvu(2,1,3) = 0
gvu(2,2,0) = (-ety(kv,jv,1)*tyyvul20-etx(kv,jv,1)*txyvul20)/rdj(kv,j
1 v)
gvu(2,2,1) = (-ety(kv,jv,1)*tyyvul21-etx(kv,jv,1)*txyvul21)/rdj(kv,j
1 v)
gvu(2,2,2) = (-ety(kv,jv,1)*tyyvul22-etx(kv,jv,1)*txyvul22)/rdj(kv,j
1 v)
gvu(2,2,3) = 0
gvu(2,3,0) = 0
gvu(2,3,1) = 0
gvu(2,3,2) = 0
gvu(2,3,3) = 0
gvu(3,0,0) = (-byvu00*ety(kv,jv,1)-bxvu00*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,0,1) = (-byvu01*ety(kv,jv,1)-bxvu01*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,0,2) = (-byvu02*ety(kv,jv,1)-bxvu02*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,0,3) = (-byvu03*ety(kv,jv,1)-bxvu03*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,1,0) = (-byvu10*ety(kv,jv,1)-bxvu10*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,1,1) = (-byvu11*ety(kv,jv,1)-bxvu11*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,1,2) = (-byvu12*ety(kv,jv,1)-bxvu12*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,1,3) = (-byvu13*ety(kv,jv,1)-bxvu13*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,2,0) = (-byvu20*ety(kv,jv,1)-bxvu20*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,2,1) = (-byvu21*ety(kv,jv,1)-bxvu21*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,2,2) = (-byvu22*ety(kv,jv,1)-bxvu22*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,2,3) = (-byvu23*ety(kv,jv,1)-bxvu23*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,3,0) = (-byvu30*ety(kv,jv,1)-bxvu30*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,3,1) = (-byvu31*ety(kv,jv,1)-bxvu31*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,3,2) = (-byvu32*ety(kv,jv,1)-bxvu32*etx(kv,jv,1))/rdj(kv,jv)
gvu(3,3,3) = 0

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gvv(0,0,0) = 0
gvv(0,0,1) = 0
gvv(0,0,2) = 0
gvv(0,0,3) = 0
gvv(0,1,0) = 0
gvv(0,1,1) = 0
gvv(0,1,2) = 0
gvv(0,1,3) = 0
gvv(0,2,0) = 0
gvv(0,2,1) = 0
gvv(0,2,2) = 0
gvv(0,2,3) = 0
gvv(0,3,0) = 0
gvv(0,3,1) = 0
gvv(0,3,2) = 0
gvv(0,3,3) = 0
gvv(1,0,0) = (-ety(kv,jv,1)*txyv00-etx(kv,jv,1)*txxv00)/rdj(kv,j
1 v)
gvv(1,0,1) = (-ety(kv,jv,1)*txyv01-etx(kv,jv,1)*txxv01)/rdj(kv,j
1 v)
gvv(1,0,2) = (-ety(kv,jv,1)*txyv02-etx(kv,jv,1)*txxv02)/rdj(kv,j
1 v)
gvv(1,0,3) = 0
gvv(1,1,0) = (-ety(kv,jv,1)*txyv10-etx(kv,jv,1)*txxv10)/rdj(kv,j
1 v)
gvv(1,1,1) = (-ety(kv,jv,1)*txyv11-etx(kv,jv,1)*txxv11)/rdj(kv,j
1 v)
gvv(1,1,2) = (-ety(kv,jv,1)*txyv12-etx(kv,jv,1)*txxv12)/rdj(kv,j
1 v)
gvv(1,1,3) = 0
gvv(1,2,0) = (-ety(kv,jv,1)*txyv20-etx(kv,jv,1)*txxv20)/rdj(kv,j
1 v)
gvv(1,2,1) = (-ety(kv,jv,1)*txyv21-etx(kv,jv,1)*txxv21)/rdj(kv,j
1 v)
gvv(1,2,2) = (-ety(kv,jv,1)*txyv22-etx(kv,jv,1)*txxv22)/rdj(kv,j
1 v)
gvv(1,2,3) = 0
gvv(1,3,0) = 0
gvv(1,3,1) = 0
gvv(1,3,2) = 0
gvv(1,3,3) = 0
gvv(2,0,0) = (-ety(kv,jv,1)*tyyv00-etx(kv,jv,1)*txyv00)/rdj(kv,j
1 v)
gvv(2,0,1) = (-ety(kv,jv,1)*tyyv01-etx(kv,jv,1)*txyv01)/rdj(kv,j
1 v)
gvv(2,0,2) = (-ety(kv,jv,1)*tyyv02-etx(kv,jv,1)*txyv02)/rdj(kv,j
1 v)
gvv(2,0,3) = 0
gvv(2,1,0) = (-ety(kv,jv,1)*tyyv10-etx(kv,jv,1)*txyv10)/rdj(kv,j
1 v)
gvv(2,1,1) = (-ety(kv,jv,1)*tyyv11-etx(kv,jv,1)*txyv11)/rdj(kv,j
1 v)
gvv(2,1,2) = (-ety(kv,jv,1)*tyyv12-etx(kv,jv,1)*txyv12)/rdj(kv,j
1 v)
gvv(2,1,3) = 0
gvv(2,2,0) = (-ety(kv,jv,1)*tyyv20-etx(kv,jv,1)*txyv20)/rdj(kv,j
1 v)
gvv(2,2,1) = (-ety(kv,jv,1)*tyyv21-etx(kv,jv,1)*txyv21)/rdj(kv,j
1 v)

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gvv(2,2,2) = (-ety(kv,jv,1)*tyvv22-etx(kv,jv,1)*txvv22)/rdj(kv,j
1 v)
gvv(2,2,3) = 0
gvv(2,3,0) = 0
gvv(2,3,1) = 0
gvv(2,3,2) = 0
gvv(2,3,3) = 0
gvv(3,0,0) = (-byvv00*ety(kv,jv,1)-bxvv00*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,0,1) = (-byvv01*ety(kv,jv,1)-bxvv01*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,0,2) = (-byvv02*ety(kv,jv,1)-bxvv02*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,0,3) = (-byvv03*ety(kv,jv,1)-bxvv03*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,1,0) = (-byvv10*ety(kv,jv,1)-bxvv10*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,1,1) = (-byvv11*ety(kv,jv,1)-bxvv11*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,1,2) = (-byvv12*ety(kv,jv,1)-bxvv12*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,1,3) = (-byvv13*ety(kv,jv,1)-bxvv13*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,2,0) = (-byvv20*ety(kv,jv,1)-bxvv20*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,2,1) = (-byvv21*ety(kv,jv,1)-bxvv21*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,2,2) = (-byvv22*ety(kv,jv,1)-bxvv22*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,2,3) = (-byvv23*ety(kv,jv,1)-bxvv23*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,3,0) = (-byvv30*ety(kv,jv,1)-bxvv30*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,3,1) = (-byvv31*ety(kv,jv,1)-bxvv31*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,3,2) = (-byvv32*ety(kv,jv,1)-bxvv32*etx(kv,jv,1))/rdj(kv,jv)
gvv(3,3,3) = 0

```

setup for third jacobians

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duzddd(0,0,0) = -(6*roudzt(kv,jv)*rho(kv,jv,1)-24*rhodzt(kv,jv)*rh
1 ou(kv,jv,1))/rho(kv,jv,1)**5
duzddd(0,0,1) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4
duzddd(0,1,0) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4
duzddd(1,0,0) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4
duzddu(0,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
duzddu(0,0,1) = 2/rho(kv,jv,1)**3
duzddu(0,1,0) = 2/rho(kv,jv,1)**3
duzddu(1,0,0) = 2/rho(kv,jv,1)**3
duzdud(0,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
duzdud(0,0,1) = 2/rho(kv,jv,1)**3
duzdud(0,1,0) = 2/rho(kv,jv,1)**3
duzdud(1,0,0) = 2/rho(kv,jv,1)**3
duzudd(0,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
duzudd(0,0,1) = 2/rho(kv,jv,1)**3
duzudd(0,1,0) = 2/rho(kv,jv,1)**3
duzudd(1,0,0) = 2/rho(kv,jv,1)**3

duedddd(0,0,0) = -(6*roudet(kv,jv)*rho(kv,jv,1)-24*rhodet(kv,jv)*rh
1 ou(kv,jv,1))/rho(kv,jv,1)**5
duedddd(0,0,1) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
duedddd(0,1,0) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
duedddd(1,0,0) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
dueddu(0,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
dueddu(0,0,1) = 2/rho(kv,jv,1)**3
dueddu(0,1,0) = 2/rho(kv,jv,1)**3
dueddu(1,0,0) = 2/rho(kv,jv,1)**3
duedvd(0,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
duedvd(0,0,1) = 2/rho(kv,jv,1)**3
duedvd(0,1,0) = 2/rho(kv,jv,1)**3
duedvd(1,0,0) = 2/rho(kv,jv,1)**3
duevdd(0,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
duevdd(0,0,1) = 2/rho(kv,jv,1)**3
duevdd(0,1,0) = 2/rho(kv,jv,1)**3
duevdd(1,0,0) = 2/rho(kv,jv,1)**3

dvzddd(0,0,0) = -(6*rovdzt(kv,jv)*rho(kv,jv,1)-24*rhodzt(kv,jv)*rh
1 ov(kv,jv,1))/rho(kv,jv,1)**5
dvzddd(0,0,2) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4
dvzddd(0,2,0) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4
dvzddd(2,0,0) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4
dvzddu(0,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dvzddu(0,0,2) = 2/rho(kv,jv,1)**3
dvzddu(0,2,0) = 2/rho(kv,jv,1)**3
dvzddu(2,0,0) = 2/rho(kv,jv,1)**3
dvzdud(0,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dvzdud(0,0,2) = 2/rho(kv,jv,1)**3
dvzdud(0,2,0) = 2/rho(kv,jv,1)**3
dvzdud(2,0,0) = 2/rho(kv,jv,1)**3
dvzudd(0,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dvzudd(0,0,2) = 2/rho(kv,jv,1)**3
dvzudd(0,2,0) = 2/rho(kv,jv,1)**3
dvzudd(2,0,0) = 2/rho(kv,jv,1)**3

```

$dveddd(0,0,0) = -(6*rovdet(kv,jv)*rho(kv,jv,1)-24*rhodet(kv,jv)*rho(kv,jv,1))/rho(kv,jv,1)**5$
 $dveddd(0,0,2) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4$
 $dveddd(0,2,0) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4$
 $dveddd(2,0,0) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4$
 $dveddu(0,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4$
 $dveddu(0,0,2) = 2/rho(kv,jv,1)**3$
 $dveddu(0,2,0) = 2/rho(kv,jv,1)**3$
 $dveddu(2,0,0) = 2/rho(kv,jv,1)**3$
 $dvedvd(0,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4$
 $dvedvd(0,0,2) = 2/rho(kv,jv,1)**3$
 $dvedvd(0,2,0) = 2/rho(kv,jv,1)**3$
 $dvedvd(2,0,0) = 2/rho(kv,jv,1)**3$
 $dvevdd(0,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4$
 $dvevdd(0,0,2) = 2/rho(kv,jv,1)**3$
 $dvevdd(0,2,0) = 2/rho(kv,jv,1)**3$
 $dvevdd(2,0,0) = 2/rho(kv,jv,1)**3$

$pddd(0,0,0) = (rhov(kv,jv,1)**2*(3*gamma-3)+rho(kv,jv,1)**2*(3*gamma-3))/rho(kv,jv,1)**4$
 $pddd(0,0,1) = -rho(kv,jv,1)*(2*gamma-2)/rho(kv,jv,1)**3$
 $pddd(0,0,2) = -rho(kv,jv,1)*(2*gamma-2)/rho(kv,jv,1)**3$
 $pddd(0,1,0) = -rho(kv,jv,1)*(2*gamma-2)/rho(kv,jv,1)**3$
 $pddd(0,1,1) = (gamma-1)/rho(kv,jv,1)**2$
 $pddd(0,2,0) = -rho(kv,jv,1)*(2*gamma-2)/rho(kv,jv,1)**3$
 $pddd(0,2,2) = (gamma-1)/rho(kv,jv,1)**2$
 $pddd(1,0,0) = -rho(kv,jv,1)*(2*gamma-2)/rho(kv,jv,1)**3$
 $pddd(1,0,1) = (gamma-1)/rho(kv,jv,1)**2$
 $pddd(1,1,0) = (gamma-1)/rho(kv,jv,1)**2$
 $pddd(2,0,0) = -rho(kv,jv,1)*(2*gamma-2)/rho(kv,jv,1)**3$
 $pddd(2,0,2) = (gamma-1)/rho(kv,jv,1)**2$
 $pddd(2,2,0) = (gamma-1)/rho(kv,jv,1)**2$

$dezddd(0,0,0) = -(60*rhodzt(kv,jv)*rhov(kv,jv,1)**2+rho(kv,jv,1)*(-24*rovdt(kv,jv)*rhov(kv,jv,1)-24*roudt(kv,jv)*rho(kv,jv,1)-24*rhodzt(kv,jv)*rho(kv,jv,1))+60*rhodzt(kv,jv)*rho(kv,jv,1)**2)/rho(kv,jv,1)**6$
 $dezddd(0,0,1) = -(6*roudt(kv,jv)*rho(kv,jv,1)-24*rhodzt(kv,jv)*rho(kv,jv,1))/rho(kv,jv,1)**5$
 $dezddd(0,0,2) = -(6*rovdt(kv,jv)*rho(kv,jv,1)-24*rhodzt(kv,jv)*rho(kv,jv,1))/rho(kv,jv,1)**5$
 $dezddd(0,0,3) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4$
 $dezddd(0,1,0) = -(6*roudt(kv,jv)*rho(kv,jv,1)-24*rhodzt(kv,jv)*rho(kv,jv,1))/rho(kv,jv,1)**5$
 $dezddd(0,1,1) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4$
 $dezddd(0,2,0) = -(6*rovdt(kv,jv)*rho(kv,jv,1)-24*rhodzt(kv,jv)*rho(kv,jv,1))/rho(kv,jv,1)**5$
 $dezddd(0,2,2) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4$
 $dezddd(0,3,0) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4$
 $dezddd(1,0,0) = -(6*roudt(kv,jv)*rho(kv,jv,1)-24*rhodzt(kv,jv)*rho(kv,jv,1))/rho(kv,jv,1)**5$
 $dezddd(1,0,1) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4$
 $dezddd(1,1,0) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4$
 $dezddd(2,0,0) = -(6*rovdt(kv,jv)*rho(kv,jv,1)-24*rhodzt(kv,jv)*rho(kv,jv,1))/rho(kv,jv,1)**5$
 $dezddd(2,0,2) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4$
 $dezddd(2,2,0) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4$
 $dezddd(3,0,0) = -6*rhodzt(kv,jv)/rho(kv,jv,1)**4$

```

dezddu(0,0,0) = -(-12*rhov(kv,jv,1)**2-12*rhou(kv,jv,1)**2+6*rho(k
1 v,jv,1)*rhoe(kv,jv,1))/rho(kv,jv,1)**5
dezddu(0,0,1) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
dezddu(0,0,2) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dezddu(0,0,3) = 2/rho(kv,jv,1)**3
dezddu(0,1,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
dezddu(0,1,1) = 2/rho(kv,jv,1)**3
dezddu(0,2,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dezddu(0,2,2) = 2/rho(kv,jv,1)**3
dezddu(0,3,0) = 2/rho(kv,jv,1)**3
dezddu(1,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
dezddu(1,0,1) = 2/rho(kv,jv,1)**3
dezddu(1,1,0) = 2/rho(kv,jv,1)**3
dezddu(2,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dezddu(2,0,2) = 2/rho(kv,jv,1)**3
dezddu(2,2,0) = 2/rho(kv,jv,1)**3
dezddu(3,0,0) = 2/rho(kv,jv,1)**3
dezddu(0,0,0) = -(-12*rhov(kv,jv,1)**2-12*rhou(kv,jv,1)**2+6*rho(k
1 v,jv,1)*rhoe(kv,jv,1))/rho(kv,jv,1)**5
dezddu(0,0,1) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
dezddu(0,0,2) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dezddu(0,0,3) = 2/rho(kv,jv,1)**3
dezddu(0,1,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
dezddu(0,1,1) = 2/rho(kv,jv,1)**3
dezddu(0,2,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dezddu(0,2,2) = 2/rho(kv,jv,1)**3
dezddu(0,3,0) = 2/rho(kv,jv,1)**3
dezddu(1,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
dezddu(1,0,1) = 2/rho(kv,jv,1)**3
dezddu(1,1,0) = 2/rho(kv,jv,1)**3
dezddu(2,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dezddu(2,0,2) = 2/rho(kv,jv,1)**3
dezddu(2,2,0) = 2/rho(kv,jv,1)**3
dezddu(3,0,0) = 2/rho(kv,jv,1)**3
dezudd(0,0,0) = -(-12*rhov(kv,jv,1)**2-12*rhou(kv,jv,1)**2+6*rho(k
1 v,jv,1)*rhoe(kv,jv,1))/rho(kv,jv,1)**5
dezudd(0,0,1) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
dezudd(0,0,2) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dezudd(0,0,3) = 2/rho(kv,jv,1)**3
dezudd(0,1,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
dezudd(0,1,1) = 2/rho(kv,jv,1)**3
dezudd(0,2,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dezudd(0,2,2) = 2/rho(kv,jv,1)**3
dezudd(0,3,0) = 2/rho(kv,jv,1)**3
dezudd(1,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
dezudd(1,0,1) = 2/rho(kv,jv,1)**3
dezudd(1,1,0) = 2/rho(kv,jv,1)**3
dezudd(2,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
dezudd(2,0,2) = 2/rho(kv,jv,1)**3
dezudd(2,2,0) = 2/rho(kv,jv,1)**3
dezudd(3,0,0) = 2/rho(kv,jv,1)**3

deeddd(0,0,0) = -(60*rhodet(kv,jv)*rhov(kv,jv,1)**2+rho(kv,jv,1)*(
1 -24*rovdet(kv,jv)*rhov(kv,jv,1)-24*roudet(kv,jv)*rhou(kv,jv,1)-
2 24*rhodet(kv,jv)*rhoe(kv,jv,1))+60*rhodet(kv,jv)*rhou(kv,jv,1)*
3 *2+6*roedet(kv,jv)*rho(kv,jv,1)**2)/rho(kv,jv,1)**6
deeddd(0,0,1) = -(6*roudet(kv,jv)*rho(kv,jv,1)-24*rhodet(kv,jv)*rh
1 ou(kv,jv,1))/rho(kv,jv,1)**5
deeddd(0,0,2) = -(6*rovdet(kv,jv)*rho(kv,jv,1)-24*rhodet(kv,jv)*rh

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1  ov(kv,jv,1))/rho(kv,jv,1)**5
deeddd(0,0,3) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
deeddd(0,1,0) = -(6*roudet(kv,jv)*rho(kv,jv,1)-24*rhodet(kv,jv)*rh
1  ou(kv,jv,1))/rho(kv,jv,1)**5
deeddd(0,1,1) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
deeddd(0,2,0) = -(6*rovdet(kv,jv)*rho(kv,jv,1)-24*rhodet(kv,jv)*rh
1  ov(kv,jv,1))/rho(kv,jv,1)**5
deeddd(0,2,2) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
deeddd(0,3,0) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
deeddd(1,0,0) = -(6*roudet(kv,jv)*rho(kv,jv,1)-24*rhodet(kv,jv)*rh
1  ou(kv,jv,1))/rho(kv,jv,1)**5
deeddd(1,0,1) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
deeddd(1,1,0) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
deeddd(2,0,0) = -(6*rovdet(kv,jv)*rho(kv,jv,1)-24*rhodet(kv,jv)*rh
1  ov(kv,jv,1))/rho(kv,jv,1)**5
deeddd(2,0,2) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
deeddd(2,2,0) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
deeddd(3,0,0) = -6*rhodet(kv,jv)/rho(kv,jv,1)**4
deeddu(0,0,0) = -(-12*rhov(kv,jv,1)**2-12*rhou(kv,jv,1)**2+6*rho(k
1  v,jv,1)*rhou(kv,jv,1))/rho(kv,jv,1)**5
deeddu(0,0,1) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
deeddu(0,0,2) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
deeddu(0,0,3) = 2/rho(kv,jv,1)**3
deeddu(0,1,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
deeddu(0,1,1) = 2/rho(kv,jv,1)**3
deeddu(0,2,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
deeddu(0,2,2) = 2/rho(kv,jv,1)**3
deeddu(0,3,0) = 2/rho(kv,jv,1)**3
deeddu(1,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
deeddu(1,0,1) = 2/rho(kv,jv,1)**3
deeddu(1,1,0) = 2/rho(kv,jv,1)**3
deeddu(2,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
deeddu(2,0,2) = 2/rho(kv,jv,1)**3
deeddu(2,2,0) = 2/rho(kv,jv,1)**3
deeddu(3,0,0) = 2/rho(kv,jv,1)**3
deedvd(0,0,0) = -(-12*rhov(kv,jv,1)**2-12*rhou(kv,jv,1)**2+6*rho(k
1  v,jv,1)*rhou(kv,jv,1))/rho(kv,jv,1)**5
deedvd(0,0,1) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
deedvd(0,0,2) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
deedvd(0,0,3) = 2/rho(kv,jv,1)**3
deedvd(0,1,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
deedvd(0,1,1) = 2/rho(kv,jv,1)**3
deedvd(0,2,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
deedvd(0,2,2) = 2/rho(kv,jv,1)**3
deedvd(0,3,0) = 2/rho(kv,jv,1)**3
deedvd(1,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
deedvd(1,0,1) = 2/rho(kv,jv,1)**3
deedvd(1,1,0) = 2/rho(kv,jv,1)**3
deedvd(2,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
deedvd(2,0,2) = 2/rho(kv,jv,1)**3
deedvd(2,2,0) = 2/rho(kv,jv,1)**3
deedvd(3,0,0) = 2/rho(kv,jv,1)**3
deevdd(0,0,0) = -(-12*rhov(kv,jv,1)**2-12*rhou(kv,jv,1)**2+6*rho(k
1  v,jv,1)*rhou(kv,jv,1))/rho(kv,jv,1)**5
deevdd(0,0,1) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
deevdd(0,0,2) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
deevdd(0,0,3) = 2/rho(kv,jv,1)**3
deevdd(0,1,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
deevdd(0,1,1) = 2/rho(kv,jv,1)**3

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deevdd(0,2,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
deevdd(0,2,2) = 2/rho(kv,jv,1)**3
deevdd(0,3,0) = 2/rho(kv,jv,1)**3
deevdd(1,0,0) = -6*rhou(kv,jv,1)/rho(kv,jv,1)**4
deevdd(1,0,1) = 2/rho(kv,jv,1)**3
deevdd(1,1,0) = 2/rho(kv,jv,1)**3
deevdd(2,0,0) = -6*rhov(kv,jv,1)/rho(kv,jv,1)**4
deevdd(2,0,2) = 2/rho(kv,jv,1)**3
deevdd(2,2,0) = 2/rho(kv,jv,1)**3
deevdd(3,0,0) = 2/rho(kv,jv,1)**3

txxddd(0,0,0) = -rrmu(kv,jv)*(2*dvzddd(0,0,0)*zty(kv,jv,1)-4*duzddd
1 d(0,0,0)*ztx(kv,jv,1)+2*dveddd(0,0,0)*ety(kv,jv,1)-4*dueddd(0,0
2 ,0)*etx(kv,jv,1))/3.0
txxddd(0,0,1) = rrmu(kv,jv)*(4*duzddd(0,0,1)*ztx(kv,jv,1)+4*dueddd
1 (0,0,1)*etx(kv,jv,1))/3.0
txxddd(0,0,2) = -rrmu(kv,jv)*(2*dvzddd(0,0,2)*zty(kv,jv,1)+2*dvedd
1 d(0,0,2)*ety(kv,jv,1))/3.0
txxddd(0,1,0) = rrmu(kv,jv)*(4*duzddd(0,1,0)*ztx(kv,jv,1)+4*dueddd
1 (0,1,0)*etx(kv,jv,1))/3.0
txxddd(0,2,0) = -rrmu(kv,jv)*(2*dvzddd(0,2,0)*zty(kv,jv,1)+2*dvedd
1 d(0,2,0)*ety(kv,jv,1))/3.0
txxddd(1,0,0) = rrmu(kv,jv)*(4*duzddd(1,0,0)*ztx(kv,jv,1)+4*dueddd
1 (1,0,0)*etx(kv,jv,1))/3.0
txxddd(2,0,0) = -rrmu(kv,jv)*(2*dvzddd(2,0,0)*zty(kv,jv,1)+2*dvedd
1 d(2,0,0)*ety(kv,jv,1))/3.0
txxddu(0,0,0) = -rrmu(kv,jv)*(2*dvzddu(0,0,0)*zty(kv,jv,1)-4*duzdd
1 u(0,0,0)*ztx(kv,jv,1))/3.0
txxddu(0,0,1) = 4.0*duzddu(0,0,1)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
txxddu(0,0,2) = (-2.0)*dvzddu(0,0,2)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
txxddu(0,1,0) = 4.0*duzddu(0,1,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
txxddu(0,2,0) = (-2.0)*dvzddu(0,2,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
txxddu(1,0,0) = 4.0*duzddu(1,0,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
txxddu(2,0,0) = (-2.0)*dvzddu(2,0,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
txxddu(0,0,0) = -rrmu(kv,jv)*(2*dveddv(0,0,0)*ety(kv,jv,1)-4*duedd
1 v(0,0,0)*etx(kv,jv,1))/3.0
txxddu(0,0,1) = 4.0*duedd(0,0,1)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
txxddu(0,0,2) = (-2.0)*dveddv(0,0,2)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
txxddu(0,1,0) = 4.0*duedd(0,1,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
txxddu(0,2,0) = (-2.0)*dveddv(0,2,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
txxddu(1,0,0) = 4.0*duedd(1,0,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
txxddu(2,0,0) = (-2.0)*dveddv(2,0,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
txxdud(0,0,0) = -rrmu(kv,jv)*(2*dvzdud(0,0,0)*zty(kv,jv,1)-4*duzdu
1 d(0,0,0)*ztx(kv,jv,1))/3.0
txxdud(0,0,1) = 4.0*duzdud(0,0,1)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
txxdud(0,0,2) = (-2.0)*dvzdud(0,0,2)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
txxdud(0,1,0) = 4.0*duzdud(0,1,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
txxdud(0,2,0) = (-2.0)*dvzdud(0,2,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
txxdud(1,0,0) = 4.0*duzdud(1,0,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
txxdud(2,0,0) = (-2.0)*dvzdud(2,0,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
txxdvd(0,0,0) = -rrmu(kv,jv)*(2*dvedvd(0,0,0)*ety(kv,jv,1)-4*duedv
1 d(0,0,0)*etx(kv,jv,1))/3.0
txxdvd(0,0,1) = 4.0*duedvd(0,0,1)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
txxdvd(0,0,2) = (-2.0)*dvedvd(0,0,2)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
txxdvd(0,1,0) = 4.0*duedvd(0,1,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
txxdvd(0,2,0) = (-2.0)*dvedvd(0,2,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
txxdvd(1,0,0) = 4.0*duedvd(1,0,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
txxdvd(2,0,0) = (-2.0)*dvedvd(2,0,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
txxuud(0,0,0) = -rrmu(kv,jv)*(2*dvzudd(0,0,0)*zty(kv,jv,1)-4*duzud

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1 d(0,0,0)*ztx(kv,jv,1))/3.0
txxudd(0,0,1) = 4.0*dzudd(0,0,1)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
txxudd(0,0,2) = (-2.0)*dvzudd(0,0,2)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
txxudd(0,1,0) = 4.0*dzudd(0,1,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
txxudd(0,2,0) = (-2.0)*dvzudd(0,2,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
txxudd(1,0,0) = 4.0*dzudd(1,0,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
txxudd(2,0,0) = (-2.0)*dvzudd(2,0,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
txxvdd(0,0,0) = -rrmu(kv,jv)*(2*dvevdd(0,0,0)*ety(kv,jv,1)-4*duev
1 d(0,0,0)*etx(kv,jv,1))/3.0
txxvdd(0,0,1) = 4.0*duevdd(0,0,1)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
txxvdd(0,0,2) = (-2.0)*dvevdd(0,0,2)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
txxvdd(0,1,0) = 4.0*duevdd(0,1,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
txxvdd(0,2,0) = (-2.0)*dvevdd(0,2,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
txxvdd(1,0,0) = 4.0*duevdd(1,0,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
txxvdd(2,0,0) = (-2.0)*dvevdd(2,0,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0

txydd(0,0,0) = rrmu(kv,jv)*(duzddd(0,0,0)*zty(kv,jv,1)+dvzddd(0,0
1 ,0)*ztx(kv,jv,1)+dueddd(0,0,0)*ety(kv,jv,1)+dveddd(0,0,0)*etx(k
2 v,jv,1))
txydd(0,0,1) = rrmu(kv,jv)*(duzddd(0,0,1)*zty(kv,jv,1)+dueddd(0,0
1 ,1)*ety(kv,jv,1))
txydd(0,0,2) = rrmu(kv,jv)*(dvzddd(0,0,2)*ztx(kv,jv,1)+dveddd(0,0
1 ,2)*etx(kv,jv,1))
txydd(0,1,0) = rrmu(kv,jv)*(duzddd(0,1,0)*zty(kv,jv,1)+dueddd(0,1
1 ,0)*ety(kv,jv,1))
txydd(0,2,0) = rrmu(kv,jv)*(dvzddd(0,2,0)*ztx(kv,jv,1)+dveddd(0,2
1 ,0)*etx(kv,jv,1))
txydd(1,0,0) = rrmu(kv,jv)*(duzddd(1,0,0)*zty(kv,jv,1)+dueddd(1,0
1 ,0)*ety(kv,jv,1))
txydd(2,0,0) = rrmu(kv,jv)*(dvzddd(2,0,0)*ztx(kv,jv,1)+dveddd(2,0
1 ,0)*etx(kv,jv,1))
txyddu(0,0,0) = rrmu(kv,jv)*(duzddu(0,0,0)*zty(kv,jv,1)+dvzddu(0,0
1 ,0)*ztx(kv,jv,1))
txyddu(0,0,1) = duzddu(0,0,1)*rrmu(kv,jv)*zty(kv,jv,1)
txyddu(0,0,2) = dvzddu(0,0,2)*rrmu(kv,jv)*ztx(kv,jv,1)
txyddu(0,1,0) = duzddu(0,1,0)*rrmu(kv,jv)*zty(kv,jv,1)
txyddu(0,2,0) = dvzddu(0,2,0)*rrmu(kv,jv)*ztx(kv,jv,1)
txyddu(1,0,0) = duzddu(1,0,0)*rrmu(kv,jv)*zty(kv,jv,1)
txyddu(2,0,0) = dvzddu(2,0,0)*rrmu(kv,jv)*ztx(kv,jv,1)
txyddu(0,0,0) = rrmu(kv,jv)*(dueddv(0,0,0)*ety(kv,jv,1)+dveddv(0,0
1 ,0)*etx(kv,jv,1))
txyddu(0,0,1) = dueddv(0,0,1)*rrmu(kv,jv)*ety(kv,jv,1)
txyddu(0,0,2) = dveddv(0,0,2)*rrmu(kv,jv)*etx(kv,jv,1)
txyddu(0,1,0) = dueddv(0,1,0)*rrmu(kv,jv)*ety(kv,jv,1)
txyddu(0,2,0) = dveddv(0,2,0)*rrmu(kv,jv)*etx(kv,jv,1)
txyddu(1,0,0) = dueddv(1,0,0)*rrmu(kv,jv)*ety(kv,jv,1)
txyddu(2,0,0) = dveddv(2,0,0)*rrmu(kv,jv)*etx(kv,jv,1)
txydud(0,0,0) = rrmu(kv,jv)*(duzdud(0,0,0)*zty(kv,jv,1)+dvzdud(0,0
1 ,0)*ztx(kv,jv,1))
txydud(0,0,1) = duzdud(0,0,1)*rrmu(kv,jv)*zty(kv,jv,1)
txydud(0,0,2) = dvzdud(0,0,2)*rrmu(kv,jv)*ztx(kv,jv,1)
txydud(0,1,0) = duzdud(0,1,0)*rrmu(kv,jv)*zty(kv,jv,1)
txydud(0,2,0) = dvzdud(0,2,0)*rrmu(kv,jv)*ztx(kv,jv,1)
txydud(1,0,0) = duzdud(1,0,0)*rrmu(kv,jv)*zty(kv,jv,1)
txydud(2,0,0) = dvzdud(2,0,0)*rrmu(kv,jv)*ztx(kv,jv,1)
txydvd(0,0,0) = rrmu(kv,jv)*(duedvd(0,0,0)*ety(kv,jv,1)+dvedvd(0,0
1 ,0)*etx(kv,jv,1))
txydvd(0,0,1) = duedvd(0,0,1)*rrmu(kv,jv)*ety(kv,jv,1)
txydvd(0,0,2) = dvedvd(0,0,2)*rrmu(kv,jv)*etx(kv,jv,1)

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txydvd(0,1,0) = duedvd(0,1,0)*rrmu(kv,jv)*ety(kv,jv,1)
txydvd(0,2,0) = dvedvd(0,2,0)*rrmu(kv,jv)*etx(kv,jv,1)
txydvd(1,0,0) = duedvd(1,0,0)*rrmu(kv,jv)*ety(kv,jv,1)
txydvd(2,0,0) = dvedvd(2,0,0)*rrmu(kv,jv)*etx(kv,jv,1)
txyuudd(0,0,0) = rrmu(kv,jv)*(duzudd(0,0,0)*zty(kv,jv,1)+dvzudd(0,0
1  ,0)*ztx(kv,jv,1))
txyuudd(0,0,1) = duzudd(0,0,1)*rrmu(kv,jv)*zty(kv,jv,1)
txyuudd(0,0,2) = dvzudd(0,0,2)*rrmu(kv,jv)*ztx(kv,jv,1)
txyuudd(0,1,0) = duzudd(0,1,0)*rrmu(kv,jv)*zty(kv,jv,1)
txyuudd(0,2,0) = dvzudd(0,2,0)*rrmu(kv,jv)*ztx(kv,jv,1)
txyuudd(1,0,0) = duzudd(1,0,0)*rrmu(kv,jv)*zty(kv,jv,1)
txyuudd(2,0,0) = dvzudd(2,0,0)*rrmu(kv,jv)*ztx(kv,jv,1)
txyvdd(0,0,0) = rrmu(kv,jv)*(duevdd(0,0,0)*ety(kv,jv,1)+dvevdd(0,0
1  ,0)*etx(kv,jv,1))
txyvdd(0,0,1) = duevdd(0,0,1)*rrmu(kv,jv)*ety(kv,jv,1)
txyvdd(0,0,2) = dvevdd(0,0,2)*rrmu(kv,jv)*etx(kv,jv,1)
txyvdd(0,1,0) = duevdd(0,1,0)*rrmu(kv,jv)*ety(kv,jv,1)
txyvdd(0,2,0) = dvevdd(0,2,0)*rrmu(kv,jv)*etx(kv,jv,1)
txyvdd(1,0,0) = duevdd(1,0,0)*rrmu(kv,jv)*ety(kv,jv,1)
txyvdd(2,0,0) = dvevdd(2,0,0)*rrmu(kv,jv)*etx(kv,jv,1)

tyydd(0,0,0) = rrmu(kv,jv)*(4*dvzddd(0,0,0)*zty(kv,jv,1)-2*duzddd
1  (0,0,0)*ztx(kv,jv,1)+4*dveddd(0,0,0)*ety(kv,jv,1)-2*dueddd(0,0,
2  0)*etx(kv,jv,1))/3.0
tyydd(0,0,1) = -rrmu(kv,jv)*(2*duzddd(0,0,1)*ztx(kv,jv,1)+2*duedd
1  d(0,0,1)*etx(kv,jv,1))/3.0
tyydd(0,0,2) = rrmu(kv,jv)*(4*dvzddd(0,0,2)*zty(kv,jv,1)+4*dveddd
1  (0,0,2)*ety(kv,jv,1))/3.0
tyydd(0,1,0) = -rrmu(kv,jv)*(2*duzddd(0,1,0)*ztx(kv,jv,1)+2*duedd
1  d(0,1,0)*etx(kv,jv,1))/3.0
tyydd(0,2,0) = rrmu(kv,jv)*(4*dvzddd(0,2,0)*zty(kv,jv,1)+4*dveddd
1  (0,2,0)*ety(kv,jv,1))/3.0
tyydd(1,0,0) = -rrmu(kv,jv)*(2*duzddd(1,0,0)*ztx(kv,jv,1)+2*duedd
1  d(1,0,0)*etx(kv,jv,1))/3.0
tyydd(2,0,0) = rrmu(kv,jv)*(4*dvzddd(2,0,0)*zty(kv,jv,1)+4*dveddd
1  (2,0,0)*ety(kv,jv,1))/3.0
tyyddu(0,0,0) = rrmu(kv,jv)*(4*dvzddu(0,0,0)*zty(kv,jv,1)-2*duzddu
1  (0,0,0)*ztx(kv,jv,1))/3.0
tyyddu(0,0,1) = (-2.0)*duzddu(0,0,1)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
tyyddu(0,0,2) = 4.0*dvzddu(0,0,2)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
tyyddu(0,1,0) = (-2.0)*duzddu(0,1,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
tyyddu(0,2,0) = 4.0*dvzddu(0,2,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
tyyddu(1,0,0) = (-2.0)*duzddu(1,0,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
tyyddu(2,0,0) = 4.0*dvzddu(2,0,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
tyyddu(0,0,0) = rrmu(kv,jv)*(4*dveddv(0,0,0)*ety(kv,jv,1)-2*dueddv
1  (0,0,0)*etx(kv,jv,1))/3.0
tyyddu(0,0,1) = (-2.0)*dueddv(0,0,1)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
tyyddu(0,0,2) = 4.0*dveddv(0,0,2)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
tyyddu(0,1,0) = (-2.0)*dueddv(0,1,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
tyyddu(0,2,0) = 4.0*dveddv(0,2,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
tyyddu(1,0,0) = (-2.0)*dueddv(1,0,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
tyyddu(2,0,0) = 4.0*dveddv(2,0,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
tyydu(0,0,0) = rrmu(kv,jv)*(4*dvzdud(0,0,0)*zty(kv,jv,1)-2*duzdud
1  (0,0,0)*ztx(kv,jv,1))/3.0
tyydu(0,0,1) = (-2.0)*duzdud(0,0,1)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
tyydu(0,0,2) = 4.0*dvzdud(0,0,2)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
tyydu(0,1,0) = (-2.0)*duzdud(0,1,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
tyydu(0,2,0) = 4.0*dvzdud(0,2,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
tyydu(1,0,0) = (-2.0)*duzdud(1,0,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0

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    tyydud(2,0,0) = 4.0*dvzdud(2,0,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
    tyydvd(0,0,0) = rrmu(kv,jv)*(4*dvedvd(0,0,0)*ety(kv,jv,1)-2*duedvd
1    (0,0,0)*etx(kv,jv,1))/3.0
    tyydvd(0,0,1) = (-2.0)*duedvd(0,0,1)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
    tyydvd(0,0,2) = 4.0*dvedvd(0,0,2)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
    tyydvd(0,1,0) = (-2.0)*duedvd(0,1,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
    tyydvd(0,2,0) = 4.0*dvedvd(0,2,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
    tyydvd(1,0,0) = (-2.0)*duedvd(1,0,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
    tyydvd(2,0,0) = 4.0*dvedvd(2,0,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
    tyyudd(0,0,0) = rrmu(kv,jv)*(4*dvzudd(0,0,0)*zty(kv,jv,1)-2*dzudd
1    (0,0,0)*ztx(kv,jv,1))/3.0
    tyyudd(0,0,1) = (-2.0)*dzudd(0,0,1)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
    tyyudd(0,0,2) = 4.0*dvzudd(0,0,2)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
    tyyudd(0,1,0) = (-2.0)*dzudd(0,1,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
    tyyudd(0,2,0) = 4.0*dvzudd(0,2,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
    tyyudd(1,0,0) = (-2.0)*dzudd(1,0,0)*rrmu(kv,jv)*ztx(kv,jv,1)/3.0
    tyyudd(2,0,0) = 4.0*dvzudd(2,0,0)*rrmu(kv,jv)*zty(kv,jv,1)/3.0
    tyyvdd(0,0,0) = rrmu(kv,jv)*(4*dvevdd(0,0,0)*ety(kv,jv,1)-2*duevdd
1    (0,0,0)*etx(kv,jv,1))/3.0
    tyyvdd(0,0,1) = (-2.0)*duevdd(0,0,1)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
    tyyvdd(0,0,2) = 4.0*dvevdd(0,0,2)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
    tyyvdd(0,1,0) = (-2.0)*duevdd(0,1,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
    tyyvdd(0,2,0) = 4.0*dvevdd(0,2,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0
    tyyvdd(1,0,0) = (-2.0)*duevdd(1,0,0)*rrmu(kv,jv)*etx(kv,jv,1)/3.0
    tyyvdd(2,0,0) = 4.0*dvevdd(2,0,0)*rrmu(kv,jv)*ety(kv,jv,1)/3.0

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bxddd(0,0,0) = (rrmu(kv,jv)*rho(kv,jv,1)**4*(dezddd(0,0,0)*ztx(kv,
1  jv,1)*gamma+deeddd(0,0,0)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *3*(rhov(kv,jv,1)*txydd(0,0,0)+rhov(kv,jv,1)*txxdd(0,0,0))+rh
3  o(kv,jv,1)**2*(-3*rhov(kv,jv,1)*txydd00-3*rhou(kv,jv,1)*txxdd00
4  )+rho(kv,jv,1)*(6*rhov(kv,jv,1)*txydd0+6*rhou(kv,jv,1)*txxdd0)-6*
5  rhov(kv,jv,1)*txydd-6*rhou(kv,jv,1)*txxdd))/(rho(kv,jv,1)**4*pr)
bxddd(0,0,1) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,0,1)*ztx(kv,
1  jv,1)*gamma+deeddd(0,0,1)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*txydd(0,0,1)+rhov(kv,jv,1)*txxdd(0,0,1)+txx
3  dd00)+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txydd01-2*rhou(kv,jv,1)*tx
4  xdd01-2*txxdd0)+2*rhov(kv,jv,1)*txydd1+2*rhou(kv,jv,1)*txxdd1+2*tx
5  x))/(rho(kv,jv,1)**3*pr)
bxddd(0,0,2) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,0,2)*ztx(kv,
1  jv,1)*gamma+deeddd(0,0,2)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*txydd(0,0,2)+txydd00+rhou(kv,jv,1)*txxdd(0,
3  0,2))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txydd02-2*txydd0-2*rhou(kv,
4  jv,1)*txxdd02)+2*rhov(kv,jv,1)*txydd2+2*txydd+2*rhou(kv,jv,1)*txxd
5  2))/(rho(kv,jv,1)**3*pr)
bxddd(0,0,3) = rrmu(kv,jv)*(dezddd(0,0,3)*ztx(kv,jv,1)*gamma+deedd
1  d(0,0,3)*etx(kv,jv,1)*gamma)/pr
bxddd(0,1,0) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,1,0)*ztx(kv,
1  jv,1)*gamma+deeddd(0,1,0)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*txydd(0,1,0)+rhov(kv,jv,1)*txxdd(0,1,0)+txx
3  dd00)+rho(kv,jv,1)*(rhov(kv,jv,1)*(-txydd10-txydd01)+rhou(kv,jv
4  ,1)*(-txxdd10-txxdd01)-2*txxdd0)+2*rhov(kv,jv,1)*txydd1+2*rhou(kv
5  ,jv,1)*txxdd1+2*txx))/(rho(kv,jv,1)**3*pr)
bxddd(0,1,1) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(0,1,1)*ztx(kv,
1  jv,1)*gamma+deeddd(0,1,1)*etx(kv,jv,1)*gamma)+pr*(2*rho(kv,jv,1
2  )*txxdd01-2*txxdd1))/(rho(kv,jv,1)**2*pr)
bxddd(0,1,2) = (rho(kv,jv,1)*(txydd01+txxdd02)-txydd1-txxd2)/rho(kv
1  ,jv,1)**2
bxddd(0,2,0) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,2,0)*ztx(kv,
1  jv,1)*gamma+deeddd(0,2,0)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*txydd(0,2,0)+txydd00+rhou(kv,jv,1)*txxdd(0,
3  2,0))+rho(kv,jv,1)*(rhov(kv,jv,1)*(-txydd20-txydd02)-2*txydd0+rh
4  ou(kv,jv,1)*(-txxdd20-txxdd02))+2*rhov(kv,jv,1)*txydd2+2*txydd+2*r
5  hou(kv,jv,1)*txxdd2))/(rho(kv,jv,1)**3*pr)
bxddd(0,2,1) = (rho(kv,jv,1)*(txydd01+txxdd02)-txydd1-txxd2)/rho(kv
1  ,jv,1)**2
bxddd(0,2,2) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(0,2,2)*ztx(kv,
1  jv,1)*gamma+deeddd(0,2,2)*etx(kv,jv,1)*gamma)+pr*(2*rho(kv,jv,1
2  )*txydd02-2*txydd2))/(rho(kv,jv,1)**2*pr)
bxddd(0,3,0) = rrmu(kv,jv)*(dezddd(0,3,0)*ztx(kv,jv,1)*gamma+deedd
1  d(0,3,0)*etx(kv,jv,1)*gamma)/pr
bxddd(1,0,0) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(1,0,0)*ztx(kv,
1  jv,1)*gamma+deeddd(1,0,0)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*txydd(1,0,0)+rhov(kv,jv,1)*txxdd(1,0,0)+txx
3  dd00)+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txydd10-2*rhou(kv,jv,1)*tx
4  xdd10-2*txxdd0)+2*rhov(kv,jv,1)*txydd1+2*rhou(kv,jv,1)*txxdd1+2*tx
5  x))/(rho(kv,jv,1)**3*pr)
bxddd(1,0,1) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(1,0,1)*ztx(kv,
1  jv,1)*gamma+deeddd(1,0,1)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  (txxdd10+txxdd01)-2*txxdd1))/(rho(kv,jv,1)**2*pr)
bxddd(1,0,2) = (rho(kv,jv,1)*(txydd10+txxdd02)-txydd1-txxd2)/rho(kv
1  ,jv,1)**2
bxddd(1,1,0) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(1,1,0)*ztx(kv,
1  jv,1)*gamma+deeddd(1,1,0)*etx(kv,jv,1)*gamma)+pr*(2*rho(kv,jv,1
2  )*txxdd10-2*txxdd1))/(rho(kv,jv,1)**2*pr)
bxddd(1,2,0) = (rho(kv,jv,1)*(txydd10+txxdd20)-txydd1-txxd2)/rho(kv

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bxddd(0,0,0) = (rrmu(kv,jv)*rho(kv,jv,1)**4*(dezddd(0,0,0)*ztx(kv,
1  jv,1)*gamma+deeddd(0,0,0)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *3*(rhov(kv,jv,1)*txydd(0,0,0)+rhov(kv,jv,1)*txxdd(0,0,0))+rh
3  o(kv,jv,1)**2*(-3*rhov(kv,jv,1)*txydd00-3*rhou(kv,jv,1)*txxdd00
4  )+rho(kv,jv,1)*(6*rhov(kv,jv,1)*txydd0+6*rhou(kv,jv,1)*txxdd0)-6*
5  rhov(kv,jv,1)*txydd-6*rhou(kv,jv,1)*txxdd))/(rho(kv,jv,1)**4*pr)
bxddd(0,0,1) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,0,1)*ztx(kv,
1  jv,1)*gamma+deeddd(0,0,1)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*txydd(0,0,1)+rhov(kv,jv,1)*txxdd(0,0,1)+txx
3  dd00)+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txydd01-2*rhou(kv,jv,1)*tx
4  xdd01-2*txxdd0)+2*rhov(kv,jv,1)*txydd1+2*rhou(kv,jv,1)*txxdd1+2*tx
5  x))/(rho(kv,jv,1)**3*pr)
bxddd(0,0,2) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,0,2)*ztx(kv,
1  jv,1)*gamma+deeddd(0,0,2)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*txydd(0,0,2)+txydd00+rhou(kv,jv,1)*txxdd(0,
3  0,2))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txydd02-2*txydd0-2*rhou(kv,
4  jv,1)*txxdd02)+2*rhov(kv,jv,1)*txydd2+2*txydd+2*rhou(kv,jv,1)*txxdd
5  2))/(rho(kv,jv,1)**3*pr)
bxddd(0,0,3) = rrmu(kv,jv)*(dezddd(0,0,3)*ztx(kv,jv,1)*gamma+deedd
1  d(0,0,3)*etx(kv,jv,1)*gamma)/pr
bxddd(0,1,0) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,1,0)*ztx(kv,
1  jv,1)*gamma+deeddd(0,1,0)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*txydd(0,1,0)+rhov(kv,jv,1)*txxdd(0,1,0)+txx
3  dd00)+rho(kv,jv,1)*(rhov(kv,jv,1)*(-txydd10-txydd01)+rhou(kv,jv
4  ,1)*(-txxdd10-txxdd01)-2*txxdd0)+2*rhov(kv,jv,1)*txydd1+2*rhou(kv
5  ,jv,1)*txxdd1+2*txxdd))/(rho(kv,jv,1)**3*pr)
bxddd(0,1,1) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(0,1,1)*ztx(kv,
1  jv,1)*gamma+deeddd(0,1,1)*etx(kv,jv,1)*gamma)+pr*(2*rho(kv,jv,1
2  )*txxdd01-2*txxdd1))/(rho(kv,jv,1)**2*pr)
bxddd(0,1,2) = (rho(kv,jv,1)*(txydd01+txxdd02)-txydd1-txxdd2)/rho(kv
1  ,jv,1)**2
bxddd(0,2,0) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,2,0)*ztx(kv,
1  jv,1)*gamma+deeddd(0,2,0)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*txydd(0,2,0)+txydd00+rhou(kv,jv,1)*txxdd(0,
3  2,0))+rho(kv,jv,1)*(rhov(kv,jv,1)*(-txydd20-txydd02)-2*txydd0+rh
4  ou(kv,jv,1)*(-txxdd20-txxdd02))+2*rhov(kv,jv,1)*txydd2+2*txydd+2*r
5  hou(kv,jv,1)*txxdd2))/(rho(kv,jv,1)**3*pr)
bxddd(0,2,1) = (rho(kv,jv,1)*(txydd01+txxdd02)-txydd1-txxdd2)/rho(kv
1  ,jv,1)**2
bxddd(0,2,2) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(0,2,2)*ztx(kv,
1  jv,1)*gamma+deeddd(0,2,2)*etx(kv,jv,1)*gamma)+pr*(2*rho(kv,jv,1
2  )*txydd02-2*txydd2))/(rho(kv,jv,1)**2*pr)
bxddd(0,3,0) = rrmu(kv,jv)*(dezddd(0,3,0)*ztx(kv,jv,1)*gamma+deedd
1  d(0,3,0)*etx(kv,jv,1)*gamma)/pr
bxddd(1,0,0) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(1,0,0)*ztx(kv,
1  jv,1)*gamma+deeddd(1,0,0)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*txydd(1,0,0)+rhov(kv,jv,1)*txxdd(1,0,0)+txx
3  dd00)+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txydd10-2*rhou(kv,jv,1)*tx
4  xdd10-2*txxdd0)+2*rhov(kv,jv,1)*txydd1+2*rhou(kv,jv,1)*txxdd1+2*tx
5  x))/(rho(kv,jv,1)**3*pr)
bxddd(1,0,1) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(1,0,1)*ztx(kv,
1  jv,1)*gamma+deeddd(1,0,1)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  (txxdd10+txxdd01)-2*txxdd1))/(rho(kv,jv,1)**2*pr)
bxddd(1,0,2) = (rho(kv,jv,1)*(txydd10+txxdd02)-txydd1-txxdd2)/rho(kv
1  ,jv,1)**2
bxddd(1,1,0) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(1,1,0)*ztx(kv,
1  jv,1)*gamma+deeddd(1,1,0)*etx(kv,jv,1)*gamma)+pr*(2*rho(kv,jv,1
2  )*txxdd10-2*txxdd1))/(rho(kv,jv,1)**2*pr)
bxddd(1,2,0) = (rho(kv,jv,1)*(txydd10+txxdd20)-txydd1-txxdd2)/rho(kv

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1 ,jv,1)**2
bxddd(2,0,0) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(2,0,0)*ztx(kv,
1 jv,1)*gamma+deeddd(2,0,0)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2 *2*(rhov(kv,jv,1)*txydd(2,0,0)+txydd00+rhov(kv,jv,1)*txxddd(2,
3 0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txydd20-2*txyd0-2*rhov(kv,
4 jv,1)*txxddd20)+2*rhov(kv,jv,1)*txydd2+2*txy+2*rhov(kv,jv,1)*txxd
5 2))/ (rho(kv,jv,1)**3*pr)
bxddd(2,0,1) = (rho(kv,jv,1)*(txydd01+txxddd20)-txyd1-txxd2)/rho(kv
1 ,jv,1)**2
bxddd(2,0,2) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(2,0,2)*ztx(kv,
1 jv,1)*gamma+deeddd(2,0,2)*etx(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2 (txydd20+txydd02)-2*txyd2))/ (rho(kv,jv,1)**2*pr)
bxddd(2,1,0) = (rho(kv,jv,1)*(txydd10+txxddd20)-txyd1-txxd2)/rho(kv
1 ,jv,1)**2
bxddd(2,2,0) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(2,2,0)*ztx(kv,
1 jv,1)*gamma+deeddd(2,2,0)*etx(kv,jv,1)*gamma)+pr*(2*rhov(kv,jv,1)
2 )*txydd20-2*txyd2))/ (rho(kv,jv,1)**2*pr)
bxddd(3,0,0) = rrmu(kv,jv)*(dezddd(3,0,0)*ztx(kv,jv,1)*gamma+deedd
1 d(3,0,0)*etx(kv,jv,1)*gamma)/pr
bxddu(0,0,0) = (dezddu(0,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*ztx(kv,j
1 v,1)*gamma+pr*(2*rhov(kv,jv,1)*txyu0+rho(kv,jv,1)*(-2*rhov(kv,j
2 v,1)*txydu00-2*rhov(kv,jv,1)*txxdu00)+rho(kv,jv,1)**2*(rhov(kv,
3 jv,1)*txyddu(0,0,0)+rhov(kv,jv,1)*txxdu(0,0,0))+2*rhov(kv,jv,1)
4 )*txxu0))/ (rho(kv,jv,1)**3*pr)
bxddu(0,0,1) = (dezddu(0,0,1)*rrmu(kv,jv)*rho(kv,jv,1)**3*ztx(kv,j
1 v,1)*gamma+pr*(2*rhov(kv,jv,1)*txyu1+rho(kv,jv,1)*(-2*rhov(kv,j
2 v,1)*txydu01-2*rhov(kv,jv,1)*txxdu01)+rho(kv,jv,1)**2*(rhov(kv,
3 jv,1)*txyddu(0,0,1)+rhov(kv,jv,1)*txxdu(0,0,1))+2*rhov(kv,jv,1)
4 )*txxu1))/ (rho(kv,jv,1)**3*pr)
bxddu(0,0,2) = (dezddu(0,0,2)*rrmu(kv,jv)*rho(kv,jv,1)**3*ztx(kv,j
1 v,1)*gamma+pr*(2*rhov(kv,jv,1)*txyu2+rho(kv,jv,1)*(-2*rhov(kv,j
2 v,1)*txydu02-2*rhov(kv,jv,1)*txxdu02)+rho(kv,jv,1)**2*(rhov(kv,
3 jv,1)*txyddu(0,0,2)+rhov(kv,jv,1)*txxdu(0,0,2))+2*rhov(kv,jv,1)
4 )*txxu2))/ (rho(kv,jv,1)**3*pr)
bxddu(0,0,3) = dezddu(0,0,3)*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr
bxddu(0,1,0) = (dezddu(0,1,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(-rhov(kv,jv,1)*txydu10+rho(kv,jv,1)*(rhov(kv,jv,
2 1)*txyddu(0,1,0)+txxdu00+rhov(kv,jv,1)*txxdu(0,1,0))-txxu0-rho
3 u(kv,jv,1)*txxdu10))/ (rho(kv,jv,1)**2*pr)
bxddu(0,1,1) = (dezddu(0,1,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*txxdu01-txxu1))/ (rho(kv,jv,1)**2*pr
2 )
bxddu(0,1,2) = (rho(kv,jv,1)*txxdu02-txxu2)/rho(kv,jv,1)**2
bxddu(0,2,0) = (dezddu(0,2,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(-txyu0-rhov(kv,jv,1)*txydu20+rho(kv,jv,1)*(txydu
2 00+rhov(kv,jv,1)*txyddu(0,2,0)+rhov(kv,jv,1)*txxdu(0,2,0))-rho
3 u(kv,jv,1)*txxdu20))/ (rho(kv,jv,1)**2*pr)
bxddu(0,2,1) = (rho(kv,jv,1)*txydu01-txyu1)/rho(kv,jv,1)**2
bxddu(0,2,2) = (dezddu(0,2,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*txydu02-txyu2))/ (rho(kv,jv,1)**2*pr
2 )
bxddu(0,3,0) = dezddu(0,3,0)*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr
bxddu(1,0,0) = (dezddu(1,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(-rhov(kv,jv,1)*txydu10+rho(kv,jv,1)*(rhov(kv,jv,
2 1)*txyddu(1,0,0)+txxdu00+rhov(kv,jv,1)*txxdu(1,0,0))-txxu0-rho
3 u(kv,jv,1)*txxdu10))/ (rho(kv,jv,1)**2*pr)
bxddu(1,0,1) = (dezddu(1,0,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*txxdu01-txxu1))/ (rho(kv,jv,1)**2*pr
2 )

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bxddu(1,0,2) = (rho(kv,jv,1)*txxdu02-txxu2)/rho(kv,jv,1)**2
bxddu(1,1,0) = (dezddu(1,1,0)*rrmu(kv,jv)*rho(kv,jv,1)*ztx(kv,jv,1
1 )*gamma+2*pr*txxdu10)/(rho(kv,jv,1)*pr)
bxddu(1,2,0) = (txydu10+txxdu20)/rho(kv,jv,1)
bxddu(2,0,0) = (dezddu(2,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(-txyu0-rhov(kv,jv,1)*txydu20+rho(kv,jv,1)*(txydu
2 00+rhov(kv,jv,1)*txyddu(2,0,0)+rho(kv,jv,1)*txxdu(2,0,0))-rho
3 u(kv,jv,1)*txxdu20))/(rho(kv,jv,1)**2*pr)
bxddu(2,0,1) = (rho(kv,jv,1)*txydu01-txyu1)/rho(kv,jv,1)**2
bxddu(2,0,2) = (dezddu(2,0,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*txydu02-txyu2))/(rho(kv,jv,1)**2*pr
2 )
bxddu(2,1,0) = (txydu10+txxdu20)/rho(kv,jv,1)
bxddu(2,2,0) = (dezddu(2,2,0)*rrmu(kv,jv)*rho(kv,jv,1)*ztx(kv,jv,1
1 )*gamma+2*pr*txydu20)/(rho(kv,jv,1)*pr)
bxddu(3,0,0) = dezddu(3,0,0)*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr
bxddu(0,0,0) = (deeddv(0,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(2*rhov(kv,jv,1)*txyv0+rho(kv,jv,1)*(-2*rhov(kv,j
2 v,1)*txydv00-2*rhou(kv,jv,1)*txxdv00)+rho(kv,jv,1)**2*(rhov(kv,
3 jv,1)*txyddv(0,0,0)+rho(kv,jv,1)*txxddv(0,0,0))+2*rhou(kv,jv,1
4 )*txxv0))/(rho(kv,jv,1)**3*pr)
bxddu(0,0,1) = (deeddv(0,0,1)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(2*rhov(kv,jv,1)*txyv1+rho(kv,jv,1)*(-2*rhov(kv,j
2 v,1)*txydv01-2*rhou(kv,jv,1)*txxdv01)+rho(kv,jv,1)**2*(rhov(kv,
3 jv,1)*txyddv(0,0,1)+rho(kv,jv,1)*txxddv(0,0,1))+2*rhou(kv,jv,1
4 )*txxv1))/(rho(kv,jv,1)**3*pr)
bxddu(0,0,2) = (deeddv(0,0,2)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(2*rhov(kv,jv,1)*txyv2+rho(kv,jv,1)*(-2*rhov(kv,j
2 v,1)*txydv02-2*rhou(kv,jv,1)*txxdv02)+rho(kv,jv,1)**2*(rhov(kv,
3 jv,1)*txyddv(0,0,2)+rho(kv,jv,1)*txxddv(0,0,2))+2*rhou(kv,jv,1
4 )*txxv2))/(rho(kv,jv,1)**3*pr)
bxddu(0,0,3) = deeddv(0,0,3)*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr
bxddu(0,1,0) = (deeddv(0,1,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(-rhov(kv,jv,1)*txydv10+rho(kv,jv,1)*(rhov(kv,jv,
2 1)*txyddv(0,1,0)+txxdv00+rhou(kv,jv,1)*txxddv(0,1,0))-txxv0-rho
3 u(kv,jv,1)*txxdv10))/(rho(kv,jv,1)**2*pr)
bxddu(0,1,1) = (deeddv(0,1,1)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txxdv01-txxv1))/(rho(kv,jv,1)**2*pr
2 )
bxddu(0,1,2) = (rho(kv,jv,1)*txxdv02-txxv2)/rho(kv,jv,1)**2
bxddu(0,2,0) = (deeddv(0,2,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(-txyv0-rhov(kv,jv,1)*txydv20+rho(kv,jv,1)*(txydv
2 00+rhov(kv,jv,1)*txyddv(0,2,0)+rho(kv,jv,1)*txxddv(0,2,0))-rho
3 u(kv,jv,1)*txxdv20))/(rho(kv,jv,1)**2*pr)
bxddu(0,2,1) = (rho(kv,jv,1)*txydv01-txyv1)/rho(kv,jv,1)**2
bxddu(0,2,2) = (deeddv(0,2,2)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txydv02-txyv2))/(rho(kv,jv,1)**2*pr
2 )
bxddu(0,3,0) = deeddv(0,3,0)*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr
bxddu(1,0,0) = (deeddv(1,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(-rhov(kv,jv,1)*txydv10+rho(kv,jv,1)*(rhov(kv,jv,
2 1)*txyddv(1,0,0)+txxdv00+rhou(kv,jv,1)*txxddv(1,0,0))-txxv0-rho
3 u(kv,jv,1)*txxdv10))/(rho(kv,jv,1)**2*pr)
bxddu(1,0,1) = (deeddv(1,0,1)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txxdv01-txxv1))/(rho(kv,jv,1)**2*pr
2 )
bxddu(1,0,2) = (rho(kv,jv,1)*txxdv02-txxv2)/rho(kv,jv,1)**2
bxddu(1,1,0) = (deeddv(1,1,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+2*pr*txxdv10)/(rho(kv,jv,1)*pr)

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bxddu(1,2,0) = (txydv10+txxdv20)/rho(kv,jv,1)
bxddu(2,0,0) = (deeddv(2,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(-txyv0-rhov(kv,jv,1)*txydv20+rho(kv,jv,1)*(txydv
2  00+rhov(kv,jv,1)*txyddv(2,0,0)+rhov(kv,jv,1)*txxddv(2,0,0))-rho
3  u(kv,jv,1)*txxdv20))/(rho(kv,jv,1)**2*pr)
bxddu(2,0,1) = (rho(kv,jv,1)*txydv01-txyv1)/rho(kv,jv,1)**2
bxddu(2,0,2) = (deeddv(2,0,2)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(rho(kv,jv,1)*txydv02-txyv2))/(rho(kv,jv,1)**2*pr
2  )
bxddu(2,1,0) = (txydv10+txxdv20)/rho(kv,jv,1)
bxddu(2,2,0) = (deeddv(2,2,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )*gamma+2*pr*txydv20)/(rho(kv,jv,1)*pr)
bxddu(3,0,0) = deeddv(3,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr
bxddud(0,0,0) = (dezdud(0,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*ztx(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-txyud00-txydu00)+r
2  hou(kv,jv,1)*(-txxud00-txxdu00))+2*rhov(kv,jv,1)*txyu0+rho(kv,j
3  v,1)**2*(rhov(kv,jv,1)*txydud(0,0,0)+rhov(kv,jv,1)*txxdud(0,0,0
4  ))+2*rhou(kv,jv,1)*txxu0))/(rho(kv,jv,1)**3*pr)
bxddud(0,0,1) = (dezdud(0,0,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1  v,1)*gamma+pr*(-rhov(kv,jv,1)*txyud01+rho(kv,jv,1)*(rhov(kv,jv,
2  1)*txydud(0,0,1)+rhov(kv,jv,1)*txxdud(0,0,1)+txxdu00)-rhov(kv,j
3  v,1)*txxud01-txxu0))/(rho(kv,jv,1)**2*pr)
bxddud(0,0,2) = (dezdud(0,0,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1  v,1)*gamma+pr*(-rhov(kv,jv,1)*txyud02-txyu0+rho(kv,jv,1)*(rhov(
2  kv,jv,1)*txydud(0,0,2)+txydu00+rhov(kv,jv,1)*txxdud(0,0,2))-rho
3  u(kv,jv,1)*txxud02))/(rho(kv,jv,1)**2*pr)
bxddud(0,0,3) = dezdud(0,0,3)*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr
bxddud(0,1,0) = (dezdud(0,1,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*ztx(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-txyud10-txydu01)+r
2  hou(kv,jv,1)*(-txxud10-txxdu01))+2*rhov(kv,jv,1)*txyu1+rho(kv,j
3  v,1)**2*(rhov(kv,jv,1)*txydud(0,1,0)+rhov(kv,jv,1)*txxdud(0,1,0
4  ))+2*rhou(kv,jv,1)*txxu1))/(rho(kv,jv,1)**3*pr)
bxddud(0,1,1) = (dezdud(0,1,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*txxdu01-txxu1))/(rho(kv,jv,1)**2*pr
2  )
bxddud(0,1,2) = (rho(kv,jv,1)*txydu01-txyu1)/rho(kv,jv,1)**2
bxddud(0,2,0) = (dezdud(0,2,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*ztx(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-txyud20-txydu02)+r
2  hou(kv,jv,1)*(-txxud20-txxdu02))+2*rhov(kv,jv,1)*txyu2+rho(kv,j
3  v,1)**2*(rhov(kv,jv,1)*txydud(0,2,0)+rhov(kv,jv,1)*txxdud(0,2,0
4  ))+2*rhou(kv,jv,1)*txxu2))/(rho(kv,jv,1)**3*pr)
bxddud(0,2,1) = (rho(kv,jv,1)*txxdu02-txxu2)/rho(kv,jv,1)**2
bxddud(0,2,2) = (dezdud(0,2,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*txydu02-txyu2))/(rho(kv,jv,1)**2*pr
2  )
bxddud(0,3,0) = dezdud(0,3,0)*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr
bxddud(1,0,0) = (dezdud(1,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*txydud(1,0,0)+txxud0
2  0+rhov(kv,jv,1)*txxdud(1,0,0))-rhov(kv,jv,1)*txydu10-txxu0-rhou
3  (kv,jv,1)*txxdu10))/(rho(kv,jv,1)**2*pr)
bxddud(1,0,1) = (dezdud(1,0,1)*rrmu(kv,jv)*rho(kv,jv,1)*ztx(kv,jv,1
1  )*gamma+pr*(txxud01+txxdu10))/(rho(kv,jv,1)*pr)
bxddud(1,0,2) = (txydu10+txxud02)/rho(kv,jv,1)
bxddud(1,1,0) = (dezdud(1,1,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*txxud10-txxu1))/(rho(kv,jv,1)**2*pr
2  )
bxddud(1,2,0) = (rho(kv,jv,1)*txxud20-txxu2)/rho(kv,jv,1)**2
bxddud(2,0,0) = (dezdud(2,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*(txyud00+rhov(kv,jv,1)*txydud(2,0,0

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2  )+rho(kv,jv,1)*txxdud(2,0,0))-txyu0-rhov(kv,jv,1)*txydu20-rhou
3  (kv,jv,1)*txxdu20))/(rho(kv,jv,1)**2*pr)
  bxdud(2,0,1) = (txyud01+txxdu20)/rho(kv,jv,1)
  bxdud(2,0,2) = (dezdud(2,0,2)*rrmu(kv,jv)*rho(kv,jv,1)*ztx(kv,jv,1
1  )*gamma+pr*(txyud02+txydu20))/(rho(kv,jv,1)*pr)
  bxdud(2,1,0) = (rho(kv,jv,1)*txyud10-txyu1)/rho(kv,jv,1)**2
  bxdud(2,2,0) = (dezdud(2,2,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*txyud20-txyu2))/(rho(kv,jv,1)**2*pr
2  )
  bxdud(3,0,0) = dezdud(3,0,0)*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr
  bxdvd(0,0,0) = (deedvd(0,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**3*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-txyvd00-txydv00)+r
2  hou(kv,jv,1)*(-txxvd00-txxdv00))+2*rhov(kv,jv,1)*txyv0+rho(kv,j
3  v,1)**2*(rhov(kv,jv,1)*txydvd(0,0,0)+rho(kv,jv,1)*txxdvd(0,0,0
4  ))+2*rhou(kv,jv,1)*txxv0))/(rho(kv,jv,1)**3*pr)
  bxdvd(0,0,1) = (deedvd(0,0,1)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(-rhov(kv,jv,1)*txyvd01+rho(kv,jv,1)*(rhov(kv,jv,
2  1)*txydvd(0,0,1)+rho(kv,jv,1)*txxdvd(0,0,1)+txxdv00)-rho(kv,j
3  v,1)*txxvd01-txxv0))/(rho(kv,jv,1)**2*pr)
  bxdvd(0,0,2) = (deedvd(0,0,2)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(-rhov(kv,jv,1)*txyvd02-txyv0+rho(kv,jv,1)*(rhov(
2  kv,jv,1)*txydvd(0,0,2)+txydv00+rho(kv,jv,1)*txxdvd(0,0,2))-rho
3  u(kv,jv,1)*txxvd02))/(rho(kv,jv,1)**2*pr)
  bxdvd(0,0,3) = deedvd(0,0,3)*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr
  bxdvd(0,1,0) = (deedvd(0,1,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**3*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-txyvd10-txydv01)+r
2  hou(kv,jv,1)*(-txxvd10-txxdv01))+2*rhov(kv,jv,1)*txyvd1+rho(kv,j
3  v,1)**2*(rhov(kv,jv,1)*txydvd(0,1,0)+rho(kv,jv,1)*txxdvd(0,1,0
4  ))+2*rhou(kv,jv,1)*txxv1))/(rho(kv,jv,1)**3*pr)
  bxdvd(0,1,1) = (deedvd(0,1,1)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(rho(kv,jv,1)*txxdv01-txxv1))/(rho(kv,jv,1)**2*pr
2  )
  bxdvd(0,1,2) = (rho(kv,jv,1)*txydv01-txyv1)/rho(kv,jv,1)**2
  bxdvd(0,2,0) = (deedvd(0,2,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**3*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-txyvd20-txydv02)+r
2  hou(kv,jv,1)*(-txxvd20-txxdv02))+2*rhov(kv,jv,1)*txyv2+rho(kv,j
3  v,1)**2*(rhov(kv,jv,1)*txydvd(0,2,0)+rho(kv,jv,1)*txxdvd(0,2,0
4  ))+2*rhou(kv,jv,1)*txxv2))/(rho(kv,jv,1)**3*pr)
  bxdvd(0,2,1) = (rho(kv,jv,1)*txxdv02-txxv2)/rho(kv,jv,1)**2
  bxdvd(0,2,2) = (deedvd(0,2,2)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(rho(kv,jv,1)*txydv02-txyv2))/(rho(kv,jv,1)**2*pr
2  )
  bxdvd(0,3,0) = deedvd(0,3,0)*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr
  bxdvd(1,0,0) = (deedvd(1,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*txydvd(1,0,0)+txxvd0
2  0+rho(kv,jv,1)*txxdvd(1,0,0))-rhov(kv,jv,1)*txydv10-txxv0-rhou
3  (kv,jv,1)*txxdv10))/(rho(kv,jv,1)**2*pr)
  bxdvd(1,0,1) = (deedvd(1,0,1)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )*gamma+pr*(txxvd01+txxdv10))/(rho(kv,jv,1)*pr)
  bxdvd(1,0,2) = (txydv10+txxvd02)/rho(kv,jv,1)
  bxdvd(1,1,0) = (deedvd(1,1,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(rho(kv,jv,1)*txxvd10-txxv1))/(rho(kv,jv,1)**2*pr
2  )
  bxdvd(1,2,0) = (rho(kv,jv,1)*txxvd20-txxv2)/rho(kv,jv,1)**2
  bxdvd(2,0,0) = (deedvd(2,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(rho(kv,jv,1)*(txyvd00+rhov(kv,jv,1)*txydvd(2,0,0
2  )+rho(kv,jv,1)*txxdvd(2,0,0))-txyv0-rhov(kv,jv,1)*txydv20-rhou
3  (kv,jv,1)*txxdv20))/(rho(kv,jv,1)**2*pr)
  bxdvd(2,0,1) = (txyvd01+txxdv20)/rho(kv,jv,1)

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bxddvd(2,0,2) = (deedvd(2,0,2)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )*gamma+pr*(txyvd02+txydv20))/(rho(kv,jv,1)*pr)
bxddvd(2,1,0) = (rho(kv,jv,1)*txyvd10-txyv1)/rho(kv,jv,1)**2
bxddvd(2,2,0) = (deedvd(2,2,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txyvd20-txyv2))/(rho(kv,jv,1)**2*pr
2 )
bxddvd(3,0,0) = deedvd(3,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr
bxudd(0,0,0) = (dezudd(0,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*txyudd(0,0,0)+rho
2 u(kv,jv,1)*txxudd(0,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txyud0
3 0-2*rhou(kv,jv,1)*txxud00)+2*rhov(kv,jv,1)*txyu0+2*rhou(kv,jv,1
4 )*txxu0))/(rho(kv,jv,1)**3*pr)
bxudd(0,0,1) = (dezudd(0,0,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*txyudd(0,0,1)+rhou(k
2 v,jv,1)*txxudd(0,0,1)+txxud00)-rhov(kv,jv,1)*txyud01-rhou(kv,jv
3 ,1)*txxud01-txxu0))/(rho(kv,jv,1)**2*pr)
bxudd(0,0,2) = (dezudd(0,0,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*txyudd(0,0,2)+txyud0
2 0+rhou(kv,jv,1)*txxudd(0,0,2))-rhov(kv,jv,1)*txyud02-txyu0-rhou
3 (kv,jv,1)*txxud02))/(rho(kv,jv,1)**2*pr)
bxudd(0,0,3) = dezudd(0,0,3)*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr
bxudd(0,1,0) = (dezudd(0,1,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*txyudd(0,1,0)+rhou(k
2 v,jv,1)*txxudd(0,1,0)+txxud00)-rhov(kv,jv,1)*txyud01-rhou(kv,jv
3 ,1)*txxud01-txxu0))/(rho(kv,jv,1)**2*pr)
bxudd(0,1,1) = (dezudd(0,1,1)*rrmu(kv,jv)*rho(kv,jv,1)*ztx(kv,jv,1
1 )*gamma+2*pr*txxud01)/(rho(kv,jv,1)*pr)
bxudd(0,1,2) = (txyud01+txxud02)/rho(kv,jv,1)
bxudd(0,2,0) = (dezudd(0,2,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*txyudd(0,2,0)+txyud0
2 0+rhou(kv,jv,1)*txxudd(0,2,0))-rhov(kv,jv,1)*txyud02-txyu0-rhou
3 (kv,jv,1)*txxud02))/(rho(kv,jv,1)**2*pr)
bxudd(0,2,1) = (txyud01+txxud02)/rho(kv,jv,1)
bxudd(0,2,2) = (dezudd(0,2,2)*rrmu(kv,jv)*rho(kv,jv,1)*ztx(kv,jv,1
1 )*gamma+2*pr*txyud02)/(rho(kv,jv,1)*pr)
bxudd(0,3,0) = dezudd(0,3,0)*rrmu(kv,jv)*ztx(kv,jv,1)*gamma/pr
bxudd(1,0,0) = (dezudd(1,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*txyudd(1,0,0)+rho
2 u(kv,jv,1)*txxudd(1,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txyud1
3 0-2*rhou(kv,jv,1)*txxud10)+2*rhov(kv,jv,1)*txyu1+2*rhou(kv,jv,1
4 )*txxu1))/(rho(kv,jv,1)**3*pr)
bxudd(1,0,1) = (dezudd(1,0,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*txxud10-txxu1))/(rho(kv,jv,1)**2*pr
2 )
bxudd(1,0,2) = (rho(kv,jv,1)*txyud10-txyu1)/rho(kv,jv,1)**2
bxudd(1,1,0) = (dezudd(1,1,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*txxud10-txxu1))/(rho(kv,jv,1)**2*pr
2 )
bxudd(1,2,0) = (rho(kv,jv,1)*txyud10-txyu1)/rho(kv,jv,1)**2
bxudd(2,0,0) = (dezudd(2,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*txyudd(2,0,0)+rho
2 u(kv,jv,1)*txxudd(2,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txyud2
3 0-2*rhou(kv,jv,1)*txxud20)+2*rhov(kv,jv,1)*txyu2+2*rhou(kv,jv,1
4 )*txxu2))/(rho(kv,jv,1)**3*pr)
bxudd(2,0,1) = (rho(kv,jv,1)*txxud20-txxu2)/rho(kv,jv,1)**2
bxudd(2,0,2) = (dezudd(2,0,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztx(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*txyud20-txyu2))/(rho(kv,jv,1)**2*pr
2 )
bxudd(2,1,0) = (rho(kv,jv,1)*txxud20-txxu2)/rho(kv,jv,1)**2

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bxudd(2,2,0) = (dezudd(2,2,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*ztz(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*txyud20-txyu2))/(rho(kv,jv,1)**2*pr
2 )
bxudd(3,0,0) = dezudd(3,0,0)*rrmu(kv,jv)*ztz(kv,jv,1)*gamma/pr
bxvdd(0,0,0) = (deevdd(0,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*txyvdd(0,0,0)+rho
2 u(kv,jv,1)*txxvdd(0,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txyvdd0
3 0-2*rhou(kv,jv,1)*txxvdd00)+2*rhov(kv,jv,1)*txyv0+2*rhou(kv,jv,1
4 )*txxv0))/(rho(kv,jv,1)**3*pr)
bxvdd(0,0,1) = (deevdd(0,0,1)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*txyvdd(0,0,1)+rhou(k
2 v,jv,1)*txxvdd(0,0,1)+txxvdd00)-rhov(kv,jv,1)*txyvdd01-rhou(kv,jv
3 ,1)*txxvdd01-txxv0))/(rho(kv,jv,1)**2*pr)
bxvdd(0,0,2) = (deevdd(0,0,2)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*txyvdd(0,0,2)+txyvdd0
2 0+rhou(kv,jv,1)*txxvdd(0,0,2))-rhov(kv,jv,1)*txyvdd02-txyv0-rhou
3 (kv,jv,1)*txxvdd02))/(rho(kv,jv,1)**2*pr)
bxvdd(0,0,3) = deevdd(0,0,3)*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr
bxvdd(0,1,0) = (deevdd(0,1,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*txyvdd(0,1,0)+rhou(k
2 v,jv,1)*txxvdd(0,1,0)+txxvdd00)-rhov(kv,jv,1)*txyvdd01-rhou(kv,jv
3 ,1)*txxvdd01-txxv0))/(rho(kv,jv,1)**2*pr)
bxvdd(0,1,1) = (deevdd(0,1,1)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )*gamma+2*pr*txxvdd01)/(rho(kv,jv,1)*pr)
bxvdd(0,1,2) = (txyvdd01+txxvdd02)/rho(kv,jv,1)
bxvdd(0,2,0) = (deevdd(0,2,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*txyvdd(0,2,0)+txyvdd0
2 0+rhou(kv,jv,1)*txxvdd(0,2,0))-rhov(kv,jv,1)*txyvdd02-txyv0-rhou
3 (kv,jv,1)*txxvdd02))/(rho(kv,jv,1)**2*pr)
bxvdd(0,2,1) = (txyvdd01+txxvdd02)/rho(kv,jv,1)
bxvdd(0,2,2) = (deevdd(0,2,2)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )*gamma+2*pr*txyvdd02)/(rho(kv,jv,1)*pr)
bxvdd(0,3,0) = deevdd(0,3,0)*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr
bxvdd(1,0,0) = (deevdd(1,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*txyvdd(1,0,0)+rho
2 u(kv,jv,1)*txxvdd(1,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txyvdd1
3 0-2*rhou(kv,jv,1)*txxvdd10)+2*rhov(kv,jv,1)*txyv1+2*rhou(kv,jv,1
4 )*txxv1))/(rho(kv,jv,1)**3*pr)
bxvdd(1,0,1) = (deevdd(1,0,1)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txxvdd10-txxv1))/(rho(kv,jv,1)**2*pr
2 )
bxvdd(1,0,2) = (rho(kv,jv,1)*txyvdd10-txyv1)/rho(kv,jv,1)**2
bxvdd(1,1,0) = (deevdd(1,1,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txxvdd10-txxv1))/(rho(kv,jv,1)**2*pr
2 )
bxvdd(1,2,0) = (rho(kv,jv,1)*txyvdd10-txyv1)/rho(kv,jv,1)**2
bxvdd(2,0,0) = (deevdd(2,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*txyvdd(2,0,0)+rho
2 u(kv,jv,1)*txxvdd(2,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*txyvdd2
3 0-2*rhou(kv,jv,1)*txxvdd20)+2*rhov(kv,jv,1)*txyv2+2*rhou(kv,jv,1
4 )*txxv2))/(rho(kv,jv,1)**3*pr)
bxvdd(2,0,1) = (rho(kv,jv,1)*txxvdd20-txxv2)/rho(kv,jv,1)**2
bxvdd(2,0,2) = (deevdd(2,0,2)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txyvdd20-txyv2))/(rho(kv,jv,1)**2*pr
2 )
bxvdd(2,1,0) = (rho(kv,jv,1)*txxvdd20-txxv2)/rho(kv,jv,1)**2
bxvdd(2,2,0) = (deevdd(2,2,0)*rrmu(kv,jv)*etx(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txyvdd20-txyv2))/(rho(kv,jv,1)**2*pr
2 )

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bxvdd(3,0,0) = deevdd(3,0,0)*rrmu(kv,jv)*etx(kv,jv,1)*gamma/pr

byddd(0,0,0) = (rrmu(kv,jv)*rho(kv,jv,1)**4*(dezddd(0,0,0)*zty(kv,
1  jv,1)*gamma+deeddd(0,0,0)*ety(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *3*(rhov(kv,jv,1)*tyydd(0,0,0)+rhov(kv,jv,1)*txydd(0,0,0))+rh
3  o(kv,jv,1)**2*(-3*rhov(kv,jv,1)*tyydd00-3*rhov(kv,jv,1)*txydd00
4  )+rho(kv,jv,1)*(6*rhov(kv,jv,1)*tyydd0+6*rhov(kv,jv,1)*txydd0)-6*
5  rhov(kv,jv,1)*tyydd-6*rhov(kv,jv,1)*txydd))/(rho(kv,jv,1)**4*pr)
byddd(0,0,1) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,0,1)*zty(kv,
1  jv,1)*gamma+deeddd(0,0,1)*ety(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*tyydd(0,0,1)+rhov(kv,jv,1)*txydd(0,0,1)+txy
3  dd00)+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*tyydd01-2*rhov(kv,jv,1)*tx
4  ydd01-2*txydd0)+2*rhov(kv,jv,1)*tyydd1+2*rhov(kv,jv,1)*txydd1+2*tx
5  y))/(rho(kv,jv,1)**3*pr)
byddd(0,0,2) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,0,2)*zty(kv,
1  jv,1)*gamma+deeddd(0,0,2)*ety(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*tyydd(0,0,2)+tyydd00+rhov(kv,jv,1)*txydd(0,
3  0,2))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*tyydd02-2*tyydd0-2*rhov(kv,
4  jv,1)*txydd02)+2*rhov(kv,jv,1)*tyydd2+2*tyydd+2*rhov(kv,jv,1)*txyd
5  2))/(rho(kv,jv,1)**3*pr)
byddd(0,0,3) = rrmu(kv,jv)*(dezddd(0,0,3)*zty(kv,jv,1)*gamma+deedd
1  d(0,0,3)*ety(kv,jv,1)*gamma)/pr
byddd(0,1,0) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,1,0)*zty(kv,
1  jv,1)*gamma+deeddd(0,1,0)*ety(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*tyydd(0,1,0)+rhov(kv,jv,1)*txydd(0,1,0)+txy
3  dd00)+rho(kv,jv,1)*(rhov(kv,jv,1)*(-tyydd10-tyydd01)+rhov(kv,jv
4  ,1)*(-txydd10-tyydd01)-2*txydd0)+2*rhov(kv,jv,1)*tyydd1+2*rhov(kv
5  ,jv,1)*txydd1+2*txydd))/(rho(kv,jv,1)**3*pr)
byddd(0,1,1) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(0,1,1)*zty(kv,
1  jv,1)*gamma+deeddd(0,1,1)*ety(kv,jv,1)*gamma)+pr*(2*rhov(kv,jv,1
2  )*txydd01-2*txydd1))/(rho(kv,jv,1)**2*pr)
byddd(0,1,2) = (rho(kv,jv,1)*(tyydd01+txydd02)-tyydd1-txyd2)/rho(kv
1  ,jv,1)**2
byddd(0,2,0) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(0,2,0)*zty(kv,
1  jv,1)*gamma+deeddd(0,2,0)*ety(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*tyydd(0,2,0)+tyydd00+rhov(kv,jv,1)*txydd(0,
3  2,0))+rho(kv,jv,1)*(rhov(kv,jv,1)*(-tyydd20-tyydd02)-2*tyydd0+rh
4  ov(kv,jv,1)*(-txydd20-tyydd02))+2*rhov(kv,jv,1)*tyydd2+2*tyydd+2*r
5  hov(kv,jv,1)*txydd2))/(rho(kv,jv,1)**3*pr)
byddd(0,2,1) = (rho(kv,jv,1)*(tyydd01+txydd02)-tyydd1-txyd2)/rho(kv
1  ,jv,1)**2
byddd(0,2,2) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(0,2,2)*zty(kv,
1  jv,1)*gamma+deeddd(0,2,2)*ety(kv,jv,1)*gamma)+pr*(2*rhov(kv,jv,1
2  )*tyydd02-2*tyydd2))/(rho(kv,jv,1)**2*pr)
byddd(0,3,0) = rrmu(kv,jv)*(dezddd(0,3,0)*zty(kv,jv,1)*gamma+deedd
1  d(0,3,0)*ety(kv,jv,1)*gamma)/pr
byddd(1,0,0) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(1,0,0)*zty(kv,
1  jv,1)*gamma+deeddd(1,0,0)*ety(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*tyydd(1,0,0)+rhov(kv,jv,1)*txydd(1,0,0)+txy
3  dd00)+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*tyydd10-2*rhov(kv,jv,1)*tx
4  ydd10-2*txydd0)+2*rhov(kv,jv,1)*tyydd1+2*rhov(kv,jv,1)*txydd1+2*tx
5  y))/(rho(kv,jv,1)**3*pr)
byddd(1,0,1) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(1,0,1)*zty(kv,
1  jv,1)*gamma+deeddd(1,0,1)*ety(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  (txydd10+txydd01)-2*txydd1))/(rho(kv,jv,1)**2*pr)
byddd(1,0,2) = (rho(kv,jv,1)*(tyydd10+txydd02)-tyydd1-txyd2)/rho(kv
1  ,jv,1)**2
byddd(1,1,0) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(1,1,0)*zty(kv,
1  jv,1)*gamma+deeddd(1,1,0)*ety(kv,jv,1)*gamma)+pr*(2*rhov(kv,jv,1

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2  )*txydd10-2*txyd1))/(rho(kv,jv,1)**2*pr)
byddd(1,2,0) = (rho(kv,jv,1)*(tyydd10+txydd20)-tyyd1-txyd2)/rho(kv
1  ,jv,1)**2
byddd(2,0,0) = (rrmu(kv,jv)*rho(kv,jv,1)**3*(dezddd(2,0,0)*zty(kv,
1  jv,1)*gamma+deeddd(2,0,0)*ety(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  *2*(rhov(kv,jv,1)*tyydd(2,0,0)+tyydd00+rhov(kv,jv,1)*txydd(2,
3  0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*tyydd20-2*tyyd0-2*rhov(kv,
4  jv,1)*txydd20)+2*rhov(kv,jv,1)*tyyd2+2*tyy+2*rhov(kv,jv,1)*txyd
5  2))/(rho(kv,jv,1)**3*pr)
byddd(2,0,1) = (rho(kv,jv,1)*(tyydd01+txydd20)-tyyd1-txyd2)/rho(kv
1  ,jv,1)**2
byddd(2,0,2) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(2,0,2)*zty(kv,
1  jv,1)*gamma+deeddd(2,0,2)*ety(kv,jv,1)*gamma)+pr*(rho(kv,jv,1)*
2  (tyydd20+tyydd02)-2*tyyd2))/(rho(kv,jv,1)**2*pr)
byddd(2,1,0) = (rho(kv,jv,1)*(tyydd10+txydd20)-tyyd1-txyd2)/rho(kv
1  ,jv,1)**2
byddd(2,2,0) = (rrmu(kv,jv)*rho(kv,jv,1)**2*(dezddd(2,2,0)*zty(kv,
1  jv,1)*gamma+deeddd(2,2,0)*ety(kv,jv,1)*gamma)+pr*(2*rhov(kv,jv,1
2  )*tyydd20-2*tyyd2))/(rho(kv,jv,1)**2*pr)
byddd(3,0,0) = rrmu(kv,jv)*(dezddd(3,0,0)*zty(kv,jv,1)*gamma+deedd
1  d(3,0,0)*ety(kv,jv,1)*gamma)/pr
byddu(0,0,0) = (dezddu(0,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*zty(kv,j
1  v,1)*gamma+pr*(2*rhov(kv,jv,1)*tyyu0+rho(kv,jv,1)*(-2*rhov(kv,j
2  v,1)*tyydu00-2*rhov(kv,jv,1)*txydu00)+rho(kv,jv,1)**2*(rhov(kv,
3  jv,1)*tyyddu(0,0,0)+rhov(kv,jv,1)*txyddu(0,0,0))+2*rhov(kv,jv,1
4  )*txyu0))/(rho(kv,jv,1)**3*pr)
byddu(0,0,1) = (dezddu(0,0,1)*rrmu(kv,jv)*rho(kv,jv,1)**3*zty(kv,j
1  v,1)*gamma+pr*(2*rhov(kv,jv,1)*tyyu1+rho(kv,jv,1)*(-2*rhov(kv,j
2  v,1)*tyyddu01-2*rhov(kv,jv,1)*txyddu01)+rho(kv,jv,1)**2*(rhov(kv,
3  jv,1)*tyyddu(0,0,1)+rhov(kv,jv,1)*txyddu(0,0,1))+2*rhov(kv,jv,1
4  )*txyu1))/(rho(kv,jv,1)**3*pr)
byddu(0,0,2) = (dezddu(0,0,2)*rrmu(kv,jv)*rho(kv,jv,1)**3*zty(kv,j
1  v,1)*gamma+pr*(2*rhov(kv,jv,1)*tyyu2+rho(kv,jv,1)*(-2*rhov(kv,j
2  v,1)*tyyddu02-2*rhov(kv,jv,1)*txyddu02)+rho(kv,jv,1)**2*(rhov(kv,
3  jv,1)*tyyddu(0,0,2)+rhov(kv,jv,1)*txyddu(0,0,2))+2*rhov(kv,jv,1
4  )*txyu2))/(rho(kv,jv,1)**3*pr)
byddu(0,0,3) = dezddu(0,0,3)*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr
byddu(0,1,0) = (dezddu(0,1,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(-rhov(kv,jv,1)*tyydd10+rho(kv,jv,1)*(rhov(kv,jv,
2  1)*tyyddu(0,1,0)+txyddu00+rhov(kv,jv,1)*txyddu(0,1,0))-txyu0-rho
3  u(kv,jv,1)*txydd10))/(rho(kv,jv,1)**2*pr)
byddu(0,1,1) = (dezddu(0,1,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*txydd01-txyu1))/(rho(kv,jv,1)**2*pr
2  )
byddu(0,1,2) = (rho(kv,jv,1)*txydd02-txyu2)/rho(kv,jv,1)**2
byddu(0,2,0) = (dezddu(0,2,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(-tyyu0-rhov(kv,jv,1)*tyydd20+rho(kv,jv,1)*(tyydd
2  00+rhov(kv,jv,1)*tyyddu(0,2,0)+rhov(kv,jv,1)*txyddu(0,2,0))-rho
3  u(kv,jv,1)*txydd20))/(rho(kv,jv,1)**2*pr)
byddu(0,2,1) = (rho(kv,jv,1)*tyydd01-txyu1)/rho(kv,jv,1)**2
byddu(0,2,2) = (dezddu(0,2,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*tyydd02-txyu2))/(rho(kv,jv,1)**2*pr
2  )
byddu(0,3,0) = dezddu(0,3,0)*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr
byddu(1,0,0) = (dezddu(1,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(-rhov(kv,jv,1)*tyydd10+rho(kv,jv,1)*(rhov(kv,jv,
2  1)*tyyddu(1,0,0)+txyddu00+rhov(kv,jv,1)*txyddu(1,0,0))-txyu0-rho
3  u(kv,jv,1)*txydd10))/(rho(kv,jv,1)**2*pr)
byddu(1,0,1) = (dezddu(1,0,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j

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1  v,1)*gamma+pr*(rho(kv,jv,1)*txydu01-txyu1))/(rho(kv,jv,1)**2*pr
2  )
byddu(1,0,2) = (rho(kv,jv,1)*txydu02-txyu2)/rho(kv,jv,1)**2
byddu(1,1,0) = (dezddu(1,1,0)*rrmu(kv,jv)*rho(kv,jv,1)*zty(kv,jv,1
1  )*gamma+2*pr*txydu10)/(rho(kv,jv,1)*pr)
byddu(1,2,0) = (tyydu10+txydu20)/rho(kv,jv,1)
byddu(2,0,0) = (dezddu(2,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(-tyyu0-rhov(kv,jv,1)*tyydu20+rho(kv,jv,1)*(tyydu
2  00+rhov(kv,jv,1)*tyyddu(2,0,0)+rhov(kv,jv,1)*txyddu(2,0,0))-rho
3  u(kv,jv,1)*txydu20))/(rho(kv,jv,1)**2*pr)
byddu(2,0,1) = (rho(kv,jv,1)*tyydu01-tyyu1)/rho(kv,jv,1)**2
byddu(2,0,2) = (dezddu(2,0,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*tyydu02-tyyu2))/(rho(kv,jv,1)**2*pr
2  )
byddu(2,1,0) = (tyydu10+txydu20)/rho(kv,jv,1)
byddu(2,2,0) = (dezddu(2,2,0)*rrmu(kv,jv)*rho(kv,jv,1)*zty(kv,jv,1
1  )*gamma+2*pr*tyydu20)/(rho(kv,jv,1)*pr)
byddu(3,0,0) = dezddu(3,0,0)*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr
byddu(0,0,0) = (deeddv(0,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1  )**3*gamma+pr*(2*rhov(kv,jv,1)*tyyv0+rho(kv,jv,1)*(-2*rhov(kv,j
2  v,1)*tyydv00-2*rhou(kv,jv,1)*txydv00)+rho(kv,jv,1)**2*(rhov(kv,
3  jv,1)*tyyddv(0,0,0)+rhou(kv,jv,1)*txyddv(0,0,0))+2*rhou(kv,jv,1
4  )*txyv0))/(rho(kv,jv,1)**3*pr)
byddu(0,0,1) = (deeddv(0,0,1)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1  )**3*gamma+pr*(2*rhov(kv,jv,1)*tyyv1+rho(kv,jv,1)*(-2*rhov(kv,j
2  v,1)*tyydv01-2*rhou(kv,jv,1)*txydv01)+rho(kv,jv,1)**2*(rhov(kv,
3  jv,1)*tyyddv(0,0,1)+rhou(kv,jv,1)*txyddv(0,0,1))+2*rhou(kv,jv,1
4  )*txyv1))/(rho(kv,jv,1)**3*pr)
byddu(0,0,2) = (deeddv(0,0,2)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1  )**3*gamma+pr*(2*rhov(kv,jv,1)*tyyv2+rho(kv,jv,1)*(-2*rhov(kv,j
2  v,1)*tyydv02-2*rhou(kv,jv,1)*txydv02)+rho(kv,jv,1)**2*(rhov(kv,
3  jv,1)*tyyddv(0,0,2)+rhou(kv,jv,1)*txyddv(0,0,2))+2*rhou(kv,jv,1
4  )*txyv2))/(rho(kv,jv,1)**3*pr)
byddu(0,0,3) = deeddv(0,0,3)*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr
byddu(0,1,0) = (deeddv(0,1,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(-rhov(kv,jv,1)*tyydv10+rho(kv,jv,1)*(rhov(kv,jv,
2  1)*tyyddv(0,1,0)+txydv00+rhou(kv,jv,1)*txyddv(0,1,0))-txyv0-rho
3  u(kv,jv,1)*txydv10))/(rho(kv,jv,1)**2*pr)
byddu(0,1,1) = (deeddv(0,1,1)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(rho(kv,jv,1)*txydv01-txyv1))/(rho(kv,jv,1)**2*pr
2  )
byddu(0,1,2) = (rho(kv,jv,1)*txydv02-txyv2)/rho(kv,jv,1)**2
byddu(0,2,0) = (deeddv(0,2,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(-tyyv0-rhov(kv,jv,1)*tyydv20+rho(kv,jv,1)*(tyydv
2  00+rhov(kv,jv,1)*tyyddv(0,2,0)+rhou(kv,jv,1)*txyddv(0,2,0))-rho
3  u(kv,jv,1)*txydv20))/(rho(kv,jv,1)**2*pr)
byddu(0,2,1) = (rho(kv,jv,1)*tyydv01-tyyv1)/rho(kv,jv,1)**2
byddu(0,2,2) = (deeddv(0,2,2)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(rho(kv,jv,1)*tyydv02-tyyv2))/(rho(kv,jv,1)**2*pr
2  )
byddu(0,3,0) = deeddv(0,3,0)*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr
byddu(1,0,0) = (deeddv(1,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(-rhov(kv,jv,1)*tyydv10+rho(kv,jv,1)*(rhov(kv,jv,
2  1)*tyyddv(1,0,0)+txydv00+rhou(kv,jv,1)*txyddv(1,0,0))-txyv0-rho
3  u(kv,jv,1)*txydv10))/(rho(kv,jv,1)**2*pr)
byddu(1,0,1) = (deeddv(1,0,1)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(rho(kv,jv,1)*txydv01-txyv1))/(rho(kv,jv,1)**2*pr
2  )
byddu(1,0,2) = (rho(kv,jv,1)*txydv02-txyv2)/rho(kv,jv,1)**2

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byddu(1,1,0) = (deeddv(1,1,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 ) *gamma+2*pr*txydv10)/(rho(kv,jv,1)*pr)
byddu(1,2,0) = (tyydv10+txydv20)/rho(kv,jv,1)
byddu(2,0,0) = (deeddv(2,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 ) **2*gamma+pr*(-tyyv0-rhov(kv,jv,1)*tyydv20+rho(kv,jv,1)*(tyydv
2 00+rhov(kv,jv,1)*tyyddv(2,0,0)+rhov(kv,jv,1)*txyddv(2,0,0))-rho
3 u(kv,jv,1)*txydv20))/(rho(kv,jv,1)**2*pr)
byddu(2,0,1) = (rho(kv,jv,1)*tyydv01-tyyv1)/rho(kv,jv,1)**2
byddu(2,0,2) = (deeddv(2,0,2)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 ) **2*gamma+pr*(rho(kv,jv,1)*tyydv02-tyyv2))/(rho(kv,jv,1)**2*pr
2 )
byddu(2,1,0) = (tyydv10+txydv20)/rho(kv,jv,1)
byddu(2,2,0) = (deeddv(2,2,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 ) *gamma+2*pr*tyydv20)/(rho(kv,jv,1)*pr)
byddu(3,0,0) = deeddv(3,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr
bydud(0,0,0) = (dezdu(0,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*zty(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-tyyud00-tyydu00)+r
2 hou(kv,jv,1)*(-txyud00-txydu00))+2*rhov(kv,jv,1)*tyyu0+rho(kv,j
3 v,1)**2*(rhov(kv,jv,1)*tyydud(0,0,0)+rhov(kv,jv,1)*txydud(0,0,0
4 ))+2*rhou(kv,jv,1)*txyu0))/(rho(kv,jv,1)**3*pr)
bydud(0,0,1) = (dezdu(0,0,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1 v,1)*gamma+pr*(-rhov(kv,jv,1)*tyyud01+rho(kv,jv,1)*(rhov(kv,jv,
2 1)*tyydud(0,0,1)+rhov(kv,jv,1)*txydud(0,0,1)+txydu00)-rhov(kv,j
3 v,1)*txyud01-txyu0))/(rho(kv,jv,1)**2*pr)
bydud(0,0,2) = (dezdu(0,0,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1 v,1)*gamma+pr*(-rhov(kv,jv,1)*tyyud02-tyyu0+rho(kv,jv,1)*(rhov(
2 kv,jv,1)*tyydud(0,0,2)+tyydu00+rhov(kv,jv,1)*txydud(0,0,2))-rho
3 u(kv,jv,1)*txyud02))/(rho(kv,jv,1)**2*pr)
bydud(0,0,3) = dezdu(0,0,3)*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr
bydud(0,1,0) = (dezdu(0,1,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*zty(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-tyyud10-tyydu01)+r
2 hou(kv,jv,1)*(-txyud10-txydu01))+2*rhov(kv,jv,1)*tyyu1+rho(kv,j
3 v,1)**2*(rhov(kv,jv,1)*tyydud(0,1,0)+rhov(kv,jv,1)*txydud(0,1,0
4 ))+2*rhou(kv,jv,1)*txyu1))/(rho(kv,jv,1)**3*pr)
bydud(0,1,1) = (dezdu(0,1,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*txydu01-txyu1))/(rho(kv,jv,1)**2*pr
2 )
bydud(0,1,2) = (rho(kv,jv,1)*tyydu01-tyyu1)/rho(kv,jv,1)**2
bydud(0,2,0) = (dezdu(0,2,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*zty(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-tyyud20-tyydu02)+r
2 hou(kv,jv,1)*(-txyud20-txydu02))+2*rhov(kv,jv,1)*tyyu2+rho(kv,j
3 v,1)**2*(rhov(kv,jv,1)*tyydud(0,2,0)+rhov(kv,jv,1)*txydud(0,2,0
4 ))+2*rhou(kv,jv,1)*txyu2))/(rho(kv,jv,1)**3*pr)
bydud(0,2,1) = (rho(kv,jv,1)*txydu02-txyu2)/rho(kv,jv,1)**2
bydud(0,2,2) = (dezdu(0,2,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*tyydu02-tyyu2))/(rho(kv,jv,1)**2*pr
2 )
bydud(0,3,0) = dezdu(0,3,0)*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr
bydud(1,0,0) = (dezdu(1,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*tyydud(1,0,0)+txyud0
2 0+rhov(kv,jv,1)*txydud(1,0,0))-rhov(kv,jv,1)*tyydu10-tyyu0-rhou
3 (kv,jv,1)*txydu10))/(rho(kv,jv,1)**2*pr)
bydud(1,0,1) = (dezdu(1,0,1)*rrmu(kv,jv)*rho(kv,jv,1)*zty(kv,jv,1
1 ) *gamma+pr*(txyud01+txydu10))/(rho(kv,jv,1)*pr)
bydud(1,0,2) = (tyydu10+txydu02)/rho(kv,jv,1)
bydud(1,1,0) = (dezdu(1,1,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*txyud10-txyu1))/(rho(kv,jv,1)**2*pr
2 )
bydud(1,2,0) = (rho(kv,jv,1)*txyud20-txyu2)/rho(kv,jv,1)**2

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bydud(2,0,0) = (dezdud(2,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*(tyyud00+rhov(kv,jv,1)*tyydud(2,0,0
2 )+rhov(kv,jv,1)*txydud(2,0,0))-tyyu0-rhov(kv,jv,1)*tyydu20-rhou
3 (kv,jv,1)*txydu20))/(rho(kv,jv,1)**2*pr)
bydud(2,0,1) = (tyyud01+txydu20)/rho(kv,jv,1)
bydud(2,0,2) = (dezdud(2,0,2)*rrmu(kv,jv)*rho(kv,jv,1)*zty(kv,jv,1
1 )*gamma+pr*(tyyud02+tyydu20))/(rho(kv,jv,1)*pr)
bydud(2,1,0) = (rho(kv,jv,1)*tyyud10-tyyu1)/rho(kv,jv,1)**2
bydud(2,2,0) = (dezdud(2,2,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*tyyud20-tyyu2))/(rho(kv,jv,1)**2*pr
2 )
bydud(3,0,0) = dezdud(3,0,0)*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr
bydvd(0,0,0) = (deedvd(0,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-tyyvd00-tyydv00)+r
2 hou(kv,jv,1)*(-txyvd00-txydv00))+2*rhov(kv,jv,1)*tyyv0+rho(kv,j
3 v,1)**2*(rhov(kv,jv,1)*tyyvd(0,0,0)+rhov(kv,jv,1)*txydv(0,0,0
4 ))+2*rhou(kv,jv,1)*txyv0))/(rho(kv,jv,1)**3*pr)
bydvd(0,0,1) = (deedvd(0,0,1)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(-rhov(kv,jv,1)*tyyvd01+rho(kv,jv,1)*(rhov(kv,jv,
2 1)*tyyvd(0,0,1)+rhov(kv,jv,1)*txydv(0,0,1)+txydv00)-rhov(kv,j
3 v,1)*txyvd01-tyyv0))/(rho(kv,jv,1)**2*pr)
bydvd(0,0,2) = (deedvd(0,0,2)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(-rhov(kv,jv,1)*tyyvd02-tyyv0+rho(kv,jv,1)*(rhov(
2 kv,jv,1)*tyyvd(0,0,2)+tyydv00+rhov(kv,jv,1)*txydv(0,0,2))-rho
3 u(kv,jv,1)*txyvd02))/(rho(kv,jv,1)**2*pr)
bydvd(0,0,3) = deedvd(0,0,3)*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr
bydvd(0,1,0) = (deedvd(0,1,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-tyyvd10-tyydv01)+r
2 hou(kv,jv,1)*(-txyvd10-txydv01))+2*rhov(kv,jv,1)*tyyv1+rho(kv,j
3 v,1)**2*(rhov(kv,jv,1)*tyyvd(0,1,0)+rhov(kv,jv,1)*txydv(0,1,0
4 ))+2*rhou(kv,jv,1)*txyv1))/(rho(kv,jv,1)**3*pr)
bydvd(0,1,1) = (deedvd(0,1,1)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txydv01-tyyv1))/(rho(kv,jv,1)**2*pr
2 )
bydvd(0,1,2) = (rho(kv,jv,1)*tyydv01-tyyv1)/rho(kv,jv,1)**2
bydvd(0,2,0) = (deedvd(0,2,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*(-tyyvd20-tyydv02)+r
2 hou(kv,jv,1)*(-txyvd20-txydv02))+2*rhov(kv,jv,1)*tyyv2+rho(kv,j
3 v,1)**2*(rhov(kv,jv,1)*tyyvd(0,2,0)+rhov(kv,jv,1)*txydv(0,2,0
4 ))+2*rhou(kv,jv,1)*txyv2))/(rho(kv,jv,1)**3*pr)
bydvd(0,2,1) = (rho(kv,jv,1)*txydv02-tyyv2)/rho(kv,jv,1)**2
bydvd(0,2,2) = (deedvd(0,2,2)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*tyydv02-tyyv2))/(rho(kv,jv,1)**2*pr
2 )
bydvd(0,3,0) = deedvd(0,3,0)*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr
bydvd(1,0,0) = (deedvd(1,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*tyydv(1,0,0)+txydv0
2 0+rhov(kv,jv,1)*txydv(1,0,0))-rhov(kv,jv,1)*tyydv10-tyyv0-rhou
3 (kv,jv,1)*txydv10))/(rho(kv,jv,1)**2*pr)
bydvd(1,0,1) = (deedvd(1,0,1)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )*gamma+pr*(txydv01+txydv10))/(rho(kv,jv,1)*pr)
bydvd(1,0,2) = (tyydv10+txydv02)/rho(kv,jv,1)
bydvd(1,1,0) = (deedvd(1,1,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txydv10-tyyv1))/(rho(kv,jv,1)**2*pr
2 )
bydvd(1,2,0) = (rho(kv,jv,1)*txydv20-tyyv2)/rho(kv,jv,1)**2
bydvd(2,0,0) = (deedvd(2,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*(tyyvd00+rhov(kv,jv,1)*tyydv(2,0,0
2 )+rhov(kv,jv,1)*txydv(2,0,0))-tyyv0-rhov(kv,jv,1)*tyydv20-rhou

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3  (kv,jv,1)*txydv20))/(rho(kv,jv,1)**2*pr)
bydvd(2,0,1) = (tyyvd01+txydv20)/rho(kv,jv,1)
bydvd(2,0,2) = (deedvd(2,0,2)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1  )*gamma+pr*(tyyvd02+tyydv20))/(rho(kv,jv,1)*pr)
bydvd(2,1,0) = (rho(kv,jv,1)*tyyvd10-tyyv1)/rho(kv,jv,1)**2
bydvd(2,2,0) = (deedvd(2,2,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1  )**2*gamma+pr*(rho(kv,jv,1)*tyyvd20-tyyv2))/(rho(kv,jv,1)**2*pr
2  )
bydvd(3,0,0) = deedvd(3,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr
byudd(0,0,0) = (dezudd(0,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*tyyudd(0,0,0)+rho
2  u(kv,jv,1)*txyudd(0,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*tyyud0
3  0-2*rhou(kv,jv,1)*txyud00)+2*rhov(kv,jv,1)*tyyu0+2*rhou(kv,jv,1
4  )*txyu0))/(rho(kv,jv,1)**3*pr)
byudd(0,0,1) = (dezudd(0,0,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*tyyudd(0,0,1)+rhou(k
2  v,jv,1)*txyudd(0,0,1)+txyud00)-rhov(kv,jv,1)*tyyud01-rhou(kv,jv
3  ,1)*txyud01-txyu0))/(rho(kv,jv,1)**2*pr)
byudd(0,0,2) = (dezudd(0,0,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*tyyudd(0,0,2)+tyyud0
2  0+rhou(kv,jv,1)*txyudd(0,0,2))-rhov(kv,jv,1)*tyyud02-tyyu0-rhou
3  (kv,jv,1)*txyud02))/(rho(kv,jv,1)**2*pr)
byudd(0,0,3) = dezudd(0,0,3)*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr
byudd(0,1,0) = (dezudd(0,1,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*tyyudd(0,1,0)+rhou(k
2  v,jv,1)*txyudd(0,1,0)+txyud00)-rhov(kv,jv,1)*tyyud01-rhou(kv,jv
3  ,1)*txyud01-txyu0))/(rho(kv,jv,1)**2*pr)
byudd(0,1,1) = (dezudd(0,1,1)*rrmu(kv,jv)*rho(kv,jv,1)*zty(kv,jv,1
1  )*gamma+2*pr*txyud01))/(rho(kv,jv,1)*pr)
byudd(0,1,2) = (tyyud01+txyud02)/rho(kv,jv,1)
byudd(0,2,0) = (dezudd(0,2,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*tyyudd(0,2,0)+tyyud0
2  0+rhou(kv,jv,1)*txyudd(0,2,0))-rhov(kv,jv,1)*tyyud02-tyyu0-rhou
3  (kv,jv,1)*txyud02))/(rho(kv,jv,1)**2*pr)
byudd(0,2,1) = (tyyud01+txyud02)/rho(kv,jv,1)
byudd(0,2,2) = (dezudd(0,2,2)*rrmu(kv,jv)*rho(kv,jv,1)*zty(kv,jv,1
1  )*gamma+2*pr*tyyud02))/(rho(kv,jv,1)*pr)
byudd(0,3,0) = dezudd(0,3,0)*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr
byudd(1,0,0) = (dezudd(1,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*tyyudd(1,0,0)+rho
2  u(kv,jv,1)*txyudd(1,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*tyyud1
3  0-2*rhou(kv,jv,1)*txyud10)+2*rhov(kv,jv,1)*tyyu1+2*rhou(kv,jv,1
4  )*txyu1))/(rho(kv,jv,1)**3*pr)
byudd(1,0,1) = (dezudd(1,0,1)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*txyud10-txyu1))/(rho(kv,jv,1)**2*pr
2  )
byudd(1,0,2) = (rho(kv,jv,1)*tyyud10-tyyu1)/rho(kv,jv,1)**2
byudd(1,1,0) = (dezudd(1,1,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*txyud10-txyu1))/(rho(kv,jv,1)**2*pr
2  )
byudd(1,2,0) = (rho(kv,jv,1)*tyyud10-tyyu1)/rho(kv,jv,1)**2
byudd(2,0,0) = (dezudd(2,0,0)*rrmu(kv,jv)*rho(kv,jv,1)**3*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*tyyudd(2,0,0)+rho
2  u(kv,jv,1)*txyudd(2,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*tyyud2
3  0-2*rhou(kv,jv,1)*txyud20)+2*rhov(kv,jv,1)*tyyu2+2*rhou(kv,jv,1
4  )*(tyyud20-tyyu2))/(rho(kv,jv,1)**3*pr)
byudd(2,0,1) = (rho(kv,jv,1)*txyud20-txyu2)/rho(kv,jv,1)**2
byudd(2,0,2) = (dezudd(2,0,2)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1  v,1)*gamma+pr*(rho(kv,jv,1)*tyyud20-tyyu2))/(rho(kv,jv,1)**2*pr

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2 )
byudd(2,1,0) = (rho(kv,jv,1)*txyud20-txyu2)/rho(kv,jv,1)**2
byudd(2,2,0) = (dezudd(2,2,0)*rrmu(kv,jv)*rho(kv,jv,1)**2*zty(kv,j
1 v,1)*gamma+pr*(rho(kv,jv,1)*tyyud20-tyyu2))/(rho(kv,jv,1)**2*pr
2 )
byudd(3,0,0) = dezudd(3,0,0)*rrmu(kv,jv)*zty(kv,jv,1)*gamma/pr
byvdd(0,0,0) = (deevdd(0,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*tyyvdd(0,0,0)+rho
2 u(kv,jv,1)*txyvdd(0,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*tyyvdd0
3 0-2*rhou(kv,jv,1)*txyvdd00)+2*rhov(kv,jv,1)*tyyv0+2*rhou(kv,jv,1
4 )*txyv0))/(rho(kv,jv,1)**3*pr)
byvdd(0,0,1) = (deevdd(0,0,1)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*tyyvdd(0,0,1)+rhou(k
2 v,jv,1)*txyvdd(0,0,1)+txyvdd00)-rhov(kv,jv,1)*tyyvdd01-rhou(kv,jv
3 ,1)*txyvdd01-txyv0))/(rho(kv,jv,1)**2*pr)
byvdd(0,0,2) = (deevdd(0,0,2)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*tyyvdd(0,0,2)+tyyvdd0
2 0+rhou(kv,jv,1)*txyvdd(0,0,2))-rhov(kv,jv,1)*tyyvdd02-tyyv0-rhou
3 (kv,jv,1)*txyvdd02))/(rho(kv,jv,1)**2*pr)
byvdd(0,0,3) = deevdd(0,0,3)*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr
byvdd(0,1,0) = (deevdd(0,1,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*tyyvdd(0,1,0)+rhou(k
2 v,jv,1)*txyvdd(0,1,0)+txyvdd00)-rhov(kv,jv,1)*tyyvdd01-rhou(kv,jv
3 ,1)*txyvdd01-txyv0))/(rho(kv,jv,1)**2*pr)
byvdd(0,1,1) = (deevdd(0,1,1)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )*gamma+2*pr*txyvdd01)/(rho(kv,jv,1)*pr)
byvdd(0,1,2) = (tyyvdd01+txyvdd02)/rho(kv,jv,1)
byvdd(0,2,0) = (deevdd(0,2,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*(rhov(kv,jv,1)*tyyvdd(0,2,0)+tyyvdd0
2 0+rhou(kv,jv,1)*txyvdd(0,2,0))-rhov(kv,jv,1)*tyyvdd02-tyyv0-rhou
3 (kv,jv,1)*txyvdd02))/(rho(kv,jv,1)**2*pr)
byvdd(0,2,1) = (tyyvdd01+txyvdd02)/rho(kv,jv,1)
byvdd(0,2,2) = (deevdd(0,2,2)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )*gamma+2*pr*tyyvdd02)/(rho(kv,jv,1)*pr)
byvdd(0,3,0) = deevdd(0,3,0)*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr
byvdd(1,0,0) = (deevdd(1,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*tyyvdd(1,0,0)+rho
2 u(kv,jv,1)*txyvdd(1,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*tyyvdd1
3 0-2*rhou(kv,jv,1)*txyvdd10)+2*rhov(kv,jv,1)*tyyv1+2*rhou(kv,jv,1
4 )*txyv1))/(rho(kv,jv,1)**3*pr)
byvdd(1,0,1) = (deevdd(1,0,1)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txyvdd10-txyv1))/(rho(kv,jv,1)**2*pr
2 )
byvdd(1,0,2) = (rho(kv,jv,1)*tyyvdd10-tyyv1)/rho(kv,jv,1)**2
byvdd(1,1,0) = (deevdd(1,1,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*txyvdd10-txyv1))/(rho(kv,jv,1)**2*pr
2 )
byvdd(1,2,0) = (rho(kv,jv,1)*tyyvdd10-tyyv1)/rho(kv,jv,1)**2
byvdd(2,0,0) = (deevdd(2,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**3*gamma+pr*(rho(kv,jv,1)**2*(rhov(kv,jv,1)*tyyvdd(2,0,0)+rho
2 u(kv,jv,1)*txyvdd(2,0,0))+rho(kv,jv,1)*(-2*rhov(kv,jv,1)*tyyvdd2
3 0-2*rhou(kv,jv,1)*txyvdd20)+2*rhov(kv,jv,1)*tyyv2+2*rhou(kv,jv,1
4 )*txyv2))/(rho(kv,jv,1)**3*pr)
byvdd(2,0,1) = (rho(kv,jv,1)*txyvdd20-txyv2)/rho(kv,jv,1)**2
byvdd(2,0,2) = (deevdd(2,0,2)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1
1 )**2*gamma+pr*(rho(kv,jv,1)*tyyvdd20-tyyv2))/(rho(kv,jv,1)**2*pr
2 )
byvdd(2,1,0) = (rho(kv,jv,1)*txyvdd20-txyv2)/rho(kv,jv,1)**2
byvdd(2,2,0) = (deevdd(2,2,0)*rrmu(kv,jv)*ety(kv,jv,1)*rho(kv,jv,1

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1  )**2*gamma+pr*(rho(kv,jv,1)*tyyv20-tyyv2))/(rho(kv,jv,1)**2*pr
2  )
  byvdd(3,0,0) = deevdd(3,0,0)*rrmu(kv,jv)*ety(kv,jv,1)*gamma/pr

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fppp(0,0,0,0) = 3*caudd00/rdj(kv,jv)
fppp(0,0,0,1) = 2*caudd01/rdj(kv,jv)
fppp(0,0,0,2) = 2*caudd02/rdj(kv,jv)
fppp(0,0,0,3) = 0
fppp(0,0,1,0) = caudd10/rdj(kv,jv)+caudd01/rdj(kv,jv)
fppp(0,0,1,1) = 0
fppp(0,0,1,2) = 0
fppp(0,0,1,3) = 0
fppp(0,0,2,0) = caudd20/rdj(kv,jv)+caudd02/rdj(kv,jv)
fppp(0,0,2,1) = 0
fppp(0,0,2,2) = 0
fppp(0,0,2,3) = 0
fppp(0,0,3,0) = 0
fppp(0,0,3,1) = 0
fppp(0,0,3,2) = 0
fppp(0,0,3,3) = 0
fppp(0,1,0,0) = 2*caudd10/rdj(kv,jv)
fppp(0,1,0,1) = 0
fppp(0,1,0,2) = 0
fppp(0,1,0,3) = 0
fppp(0,1,1,0) = 0
fppp(0,1,1,1) = 0
fppp(0,1,1,2) = 0
fppp(0,1,1,3) = 0
fppp(0,1,2,0) = 0
fppp(0,1,2,1) = 0
fppp(0,1,2,2) = 0
fppp(0,1,2,3) = 0
fppp(0,1,3,0) = 0
fppp(0,1,3,1) = 0
fppp(0,1,3,2) = 0
fppp(0,1,3,3) = 0
fppp(0,2,0,0) = 2*caudd20/rdj(kv,jv)
fppp(0,2,0,1) = 0
fppp(0,2,0,2) = 0
fppp(0,2,0,3) = 0
fppp(0,2,1,0) = 0
fppp(0,2,1,1) = 0
fppp(0,2,1,2) = 0
fppp(0,2,1,3) = 0
fppp(0,2,2,0) = 0
fppp(0,2,2,1) = 0
fppp(0,2,2,2) = 0
fppp(0,2,2,3) = 0
fppp(0,2,3,0) = 0
fppp(0,2,3,1) = 0
fppp(0,2,3,2) = 0
fppp(0,2,3,3) = 0
fppp(0,3,0,0) = 0
fppp(0,3,0,1) = 0
fppp(0,3,0,2) = 0
fppp(0,3,0,3) = 0
fppp(0,3,1,0) = 0
fppp(0,3,1,1) = 0
fppp(0,3,1,2) = 0
fppp(0,3,1,3) = 0
fppp(0,3,2,0) = 0
fppp(0,3,2,1) = 0
fppp(0,3,2,2) = 0

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fppp(0,3,2,3) = 0
fppp(0,3,3,0) = 0
fppp(0,3,3,1) = 0
fppp(0,3,3,2) = 0
fppp(0,3,3,3) = 0
fppp(1,0,0,0) = (ztx(kv,jv,1)*(pddd(0,0,0)-txxddd(0,0,0))-zty(kv,j
1 v,1)*txyddd(0,0,0))/rdj(kv,jv)
fppp(1,0,0,1) = (-zty(kv,jv,1)*txyddd(0,0,1)+ztx(kv,jv,1)*(pddd(0,
1 0,1)-txxddd(0,0,1))+caudd00)/rdj(kv,jv)
fppp(1,0,0,2) = (ztx(kv,jv,1)*(pddd(0,0,2)-txxddd(0,0,2))-zty(kv,j
1 v,1)*txyddd(0,0,2))/rdj(kv,jv)
fppp(1,0,0,3) = 0
fppp(1,0,1,0) = (-zty(kv,jv,1)*txyddd(0,1,0)+ztx(kv,jv,1)*(pddd(0,
1 1,0)-txxddd(0,1,0))+caudd00)/rdj(kv,jv)
fppp(1,0,1,1) = (ztx(kv,jv,1)*pddd(0,1,1)+2*caudd01)/rdj(kv,jv)
fppp(1,0,1,2) = caudd02/rdj(kv,jv)
fppp(1,0,1,3) = 0
fppp(1,0,2,0) = (ztx(kv,jv,1)*(pddd(0,2,0)-txxddd(0,2,0))-zty(kv,j
1 v,1)*txyddd(0,2,0))/rdj(kv,jv)
fppp(1,0,2,1) = caudd02/rdj(kv,jv)
fppp(1,0,2,2) = ztx(kv,jv,1)*pddd(0,2,2)/rdj(kv,jv)
fppp(1,0,2,3) = 0
fppp(1,0,3,0) = 0
fppp(1,0,3,1) = 0
fppp(1,0,3,2) = 0
fppp(1,0,3,3) = 0
fppp(1,1,0,0) = (-zty(kv,jv,1)*txyddd(1,0,0)+ztx(kv,jv,1)*(pddd(1,
1 0,0)-txxddd(1,0,0))+caudd00)/rdj(kv,jv)
fppp(1,1,0,1) = (ztx(kv,jv,1)*pddd(1,0,1)+caudd10+caudd01)/rdj(kv,
1 jv)
fppp(1,1,0,2) = caudd02/rdj(kv,jv)
fppp(1,1,0,3) = 0
fppp(1,1,1,0) = (ztx(kv,jv,1)*pddd(1,1,0)+2*caudd10)/rdj(kv,jv)
fppp(1,1,1,1) = 0
fppp(1,1,1,2) = 0
fppp(1,1,1,3) = 0
fppp(1,1,2,0) = caudd20/rdj(kv,jv)
fppp(1,1,2,1) = 0
fppp(1,1,2,2) = 0
fppp(1,1,2,3) = 0
fppp(1,1,3,0) = 0
fppp(1,1,3,1) = 0
fppp(1,1,3,2) = 0
fppp(1,1,3,3) = 0
fppp(1,2,0,0) = (ztx(kv,jv,1)*(pddd(2,0,0)-txxddd(2,0,0))-zty(kv,j
1 v,1)*txyddd(2,0,0))/rdj(kv,jv)
fppp(1,2,0,1) = caudd20/rdj(kv,jv)
fppp(1,2,0,2) = ztx(kv,jv,1)*pddd(2,0,2)/rdj(kv,jv)
fppp(1,2,0,3) = 0
fppp(1,2,1,0) = caudd20/rdj(kv,jv)
fppp(1,2,1,1) = 0
fppp(1,2,1,2) = 0
fppp(1,2,1,3) = 0
fppp(1,2,2,0) = ztx(kv,jv,1)*pddd(2,2,0)/rdj(kv,jv)
fppp(1,2,2,1) = 0
fppp(1,2,2,2) = 0
fppp(1,2,2,3) = 0
fppp(1,2,3,0) = 0
fppp(1,2,3,1) = 0

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fppp(1,2,3,2) = 0
fppp(1,2,3,3) = 0
fppp(1,3,0,0) = 0
fppp(1,3,0,1) = 0
fppp(1,3,0,2) = 0
fppp(1,3,0,3) = 0
fppp(1,3,1,0) = 0
fppp(1,3,1,1) = 0
fppp(1,3,1,2) = 0
fppp(1,3,1,3) = 0
fppp(1,3,2,0) = 0
fppp(1,3,2,1) = 0
fppp(1,3,2,2) = 0
fppp(1,3,2,3) = 0
fppp(1,3,3,0) = 0
fppp(1,3,3,1) = 0
fppp(1,3,3,2) = 0
fppp(1,3,3,3) = 0
fppp(2,0,0,0) = (zty(kv,jv,1)*(pddd(0,0,0)-tyydd(0,0,0))-stx(kv,j
1 v,1)*txydd(0,0,0))/rdj(kv,jv)
fppp(2,0,0,1) = (zty(kv,jv,1)*(pddd(0,0,1)-tyydd(0,0,1))-stx(kv,j
1 v,1)*txydd(0,0,1))/rdj(kv,jv)
fppp(2,0,0,2) = (zty(kv,jv,1)*(pddd(0,0,2)-tyydd(0,0,2))-stx(kv,j
1 v,1)*txydd(0,0,2)+caudd00)/rdj(kv,jv)
fppp(2,0,0,3) = 0
fppp(2,0,1,0) = (zty(kv,jv,1)*(pddd(0,1,0)-tyydd(0,1,0))-stx(kv,j
1 v,1)*txydd(0,1,0))/rdj(kv,jv)
fppp(2,0,1,1) = zty(kv,jv,1)*pddd(0,1,1)/rdj(kv,jv)
fppp(2,0,1,2) = caudd01/rdj(kv,jv)
fppp(2,0,1,3) = 0
fppp(2,0,2,0) = (zty(kv,jv,1)*(pddd(0,2,0)-tyydd(0,2,0))-stx(kv,j
1 v,1)*txydd(0,2,0)+caudd00)/rdj(kv,jv)
fppp(2,0,2,1) = caudd01/rdj(kv,jv)
fppp(2,0,2,2) = (zty(kv,jv,1)*pddd(0,2,2)+2*caudd02)/rdj(kv,jv)
fppp(2,0,2,3) = 0
fppp(2,0,3,0) = 0
fppp(2,0,3,1) = 0
fppp(2,0,3,2) = 0
fppp(2,0,3,3) = 0
fppp(2,1,0,0) = (zty(kv,jv,1)*(pddd(1,0,0)-tyydd(1,0,0))-stx(kv,j
1 v,1)*txydd(1,0,0))/rdj(kv,jv)
fppp(2,1,0,1) = zty(kv,jv,1)*pddd(1,0,1)/rdj(kv,jv)
fppp(2,1,0,2) = caudd10/rdj(kv,jv)
fppp(2,1,0,3) = 0
fppp(2,1,1,0) = zty(kv,jv,1)*pddd(1,1,0)/rdj(kv,jv)
fppp(2,1,1,1) = 0
fppp(2,1,1,2) = 0
fppp(2,1,1,3) = 0
fppp(2,1,2,0) = caudd10/rdj(kv,jv)
fppp(2,1,2,1) = 0
fppp(2,1,2,2) = 0
fppp(2,1,2,3) = 0
fppp(2,1,3,0) = 0
fppp(2,1,3,1) = 0
fppp(2,1,3,2) = 0
fppp(2,1,3,3) = 0
fppp(2,2,0,0) = (zty(kv,jv,1)*(pddd(2,0,0)-tyydd(2,0,0))-stx(kv,j
1 v,1)*txydd(2,0,0)+caudd00)/rdj(kv,jv)
fppp(2,2,0,1) = caudd01/rdj(kv,jv)

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fppp(2,2,0,2) = (zty(kv,jv,1)*pddd(2,0,2)+caudd20+caudd02)/rdj(kv,
1 jv)
fppp(2,2,0,3) = 0
fppp(2,2,1,0) = caudd10/rdj(kv,jv)
fppp(2,2,1,1) = 0
fppp(2,2,1,2) = 0
fppp(2,2,1,3) = 0
fppp(2,2,2,0) = (zty(kv,jv,1)*pddd(2,2,0)+2*caudd20)/rdj(kv,jv)
fppp(2,2,2,1) = 0
fppp(2,2,2,2) = 0
fppp(2,2,2,3) = 0
fppp(2,2,3,0) = 0
fppp(2,2,3,1) = 0
fppp(2,2,3,2) = 0
fppp(2,2,3,3) = 0
fppp(2,3,0,0) = 0
fppp(2,3,0,1) = 0
fppp(2,3,0,2) = 0
fppp(2,3,0,3) = 0
fppp(2,3,1,0) = 0
fppp(2,3,1,1) = 0
fppp(2,3,1,2) = 0
fppp(2,3,1,3) = 0
fppp(2,3,2,0) = 0
fppp(2,3,2,1) = 0
fppp(2,3,2,2) = 0
fppp(2,3,2,3) = 0
fppp(2,3,3,0) = 0
fppp(2,3,3,1) = 0
fppp(2,3,3,2) = 0
fppp(2,3,3,3) = 0
fppp(3,0,0,0) = (cau*pddd(0,0,0)+3*caud0*pdd00+3*caudd00*pd0-byddd
1 (0,0,0)*zty(kv,jv,1)-bxddd(0,0,0)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,0,0,1) = (cau*pddd(0,0,1)+2*caud0*pdd01+caud1*pdd00+caudd00
1 *pd1+2*caudd01*pd0-byddd(0,0,1)*zty(kv,jv,1)-bxddd(0,0,1)*ztx(k
2 v,jv,1))/rdj(kv,jv)
fppp(3,0,0,2) = (cau*pddd(0,0,2)+2*caud0*pdd02+caud2*pdd00+caudd00
1 *pd2+2*caudd02*pd0-byddd(0,0,2)*zty(kv,jv,1)-bxddd(0,0,2)*ztx(k
2 v,jv,1))/rdj(kv,jv)
fppp(3,0,0,3) = (caudd00*(pd3+1)-byddd(0,0,3)*zty(kv,jv,1)-bxddd(0
1 ,0,3)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,0,1,0) = (cau*pddd(0,1,0)+caud0*pdd10+caud0*pdd01+caud1*pdd
1 00+caudd00*pd1+caudd10*pd0+caudd01*pd0-byddd(0,1,0)*zty(kv,jv,1
2 )-bxddd(0,1,0)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,0,1,1) = (cau*pddd(0,1,1)+caud0*pdd11+2*caud1*pdd01+2*caudd
1 01*pd1-byddd(0,1,1)*zty(kv,jv,1)-bxddd(0,1,1)*ztx(kv,jv,1))/rdj
2 (kv,jv)
fppp(3,0,1,2) = (caud1*pdd02+caud2*pdd01+caudd01*pd2+caudd02*pd1-b
1 yddd(0,1,2)*zty(kv,jv,1)-bxddd(0,1,2)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,0,1,3) = caudd01*(pd3+1)/rdj(kv,jv)
fppp(3,0,2,0) = (cau*pddd(0,2,0)+caud0*pdd20+caud0*pdd02+caud2*pdd
1 00+caudd00*pd2+caudd20*pd0+caudd02*pd0-byddd(0,2,0)*zty(kv,jv,1
2 )-bxddd(0,2,0)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,0,2,1) = (caud1*pdd02+caud2*pdd01+caudd01*pd2+caudd02*pd1-b
1 yddd(0,2,1)*zty(kv,jv,1)-bxddd(0,2,1)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,0,2,2) = (cau*pddd(0,2,2)+caud0*pdd22+2*caud2*pdd02+2*caudd
1 02*pd2-byddd(0,2,2)*zty(kv,jv,1)-bxddd(0,2,2)*ztx(kv,jv,1))/rdj
2 (kv,jv)
fppp(3,0,2,3) = caudd02*(pd3+1)/rdj(kv,jv)

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fppp(3,0,3,0) = (caudd00*(pd3+1)-byddd(0,3,0)*zty(kv,jv,1)-bxddd(0
1  ,3,0)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,0,3,1) = caudd01*(pd3+1)/rdj(kv,jv)
fppp(3,0,3,2) = caudd02*(pd3+1)/rdj(kv,jv)
fppp(3,0,3,3) = 0
fppp(3,1,0,0) = (cau*pddd(1,0,0)+2*caud0*pdd10+caud1*pdd00+caudd00
1  *pd1+2*caudd10*pd0-byddd(1,0,0)*zty(kv,jv,1)-bxddd(1,0,0)*ztx(k
2  v,jv,1))/rdj(kv,jv)
fppp(3,1,0,1) = (cau*pddd(1,0,1)+caud0*pdd11+caud1*pdd10+caud1*pdd
1  01+caudd10*pd1+caudd01*pd1-byddd(1,0,1)*zty(kv,jv,1)-bxddd(1,0,
2  1)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,1,0,2) = (caud2*pdd10+caud1*pdd02+caudd10*pd2+caudd02*pd1-b
1  yddd(1,0,2)*zty(kv,jv,1)-bxddd(1,0,2)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,1,0,3) = caudd10*(pd3+1)/rdj(kv,jv)
fppp(3,1,1,0) = (cau*pddd(1,1,0)+caud0*pdd11+2*caud1*pdd10+2*caudd
1  10*pd1-byddd(1,1,0)*zty(kv,jv,1)-bxddd(1,1,0)*ztx(kv,jv,1))/rdj
2  (kv,jv)
fppp(3,1,1,1) = 3*caud1*pdd11/rdj(kv,jv)
fppp(3,1,1,2) = caud2*pdd11/rdj(kv,jv)
fppp(3,1,1,3) = 0
fppp(3,1,2,0) = (caud1*pdd20+caud2*pdd10+caudd10*pd2+caudd20*pd1-b
1  yddd(1,2,0)*zty(kv,jv,1)-bxddd(1,2,0)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,1,2,1) = caud2*pdd11/rdj(kv,jv)
fppp(3,1,2,2) = caud1*pdd22/rdj(kv,jv)
fppp(3,1,2,3) = 0
fppp(3,1,3,0) = caudd10*(pd3+1)/rdj(kv,jv)
fppp(3,1,3,1) = 0
fppp(3,1,3,2) = 0
fppp(3,1,3,3) = 0
fppp(3,2,0,0) = (cau*pddd(2,0,0)+2*caud0*pdd20+caud2*pdd00+caudd00
1  *pd2+2*caudd20*pd0-byddd(2,0,0)*zty(kv,jv,1)-bxddd(2,0,0)*ztx(k
2  v,jv,1))/rdj(kv,jv)
fppp(3,2,0,1) = (caud1*pdd20+caud2*pdd01+caudd01*pd2+caudd20*pd1-b
1  yddd(2,0,1)*zty(kv,jv,1)-bxddd(2,0,1)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,2,0,2) = (cau*pddd(2,0,2)+caud0*pdd22+caud2*pdd20+caud2*pdd
1  02+caudd20*pd2+caudd02*pd2-byddd(2,0,2)*zty(kv,jv,1)-bxddd(2,0,
2  2)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,2,0,3) = caudd20*(pd3+1)/rdj(kv,jv)
fppp(3,2,1,0) = (caud1*pdd20+caud2*pdd10+caudd10*pd2+caudd20*pd1-b
1  yddd(2,1,0)*zty(kv,jv,1)-bxddd(2,1,0)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,2,1,1) = caud2*pdd11/rdj(kv,jv)
fppp(3,2,1,2) = caud1*pdd22/rdj(kv,jv)
fppp(3,2,1,3) = 0
fppp(3,2,2,0) = (cau*pddd(2,2,0)+caud0*pdd22+2*caud2*pdd20+2*caudd
1  20*pd2-byddd(2,2,0)*zty(kv,jv,1)-bxddd(2,2,0)*ztx(kv,jv,1))/rdj
2  (kv,jv)
fppp(3,2,2,1) = caud1*pdd22/rdj(kv,jv)
fppp(3,2,2,2) = 3*caud2*pdd22/rdj(kv,jv)
fppp(3,2,2,3) = 0
fppp(3,2,3,0) = caudd20*(pd3+1)/rdj(kv,jv)
fppp(3,2,3,1) = 0
fppp(3,2,3,2) = 0
fppp(3,2,3,3) = 0
fppp(3,3,0,0) = (caudd00*(pd3+1)-byddd(3,0,0)*zty(kv,jv,1)-bxddd(3
1  ,0,0)*ztx(kv,jv,1))/rdj(kv,jv)
fppp(3,3,0,1) = caudd01*(pd3+1)/rdj(kv,jv)
fppp(3,3,0,2) = caudd02*(pd3+1)/rdj(kv,jv)
fppp(3,3,0,3) = 0
fppp(3,3,1,0) = caudd10*(pd3+1)/rdj(kv,jv)

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fppp(3,3,1,1) = 0
fppp(3,3,1,2) = 0
fppp(3,3,1,3) = 0
fppp(3,3,2,0) = caudd20*(pd3+1)/rdj(kv,jv)
fppp(3,3,2,1) = 0
fppp(3,3,2,2) = 0
fppp(3,3,2,3) = 0
fppp(3,3,3,0) = 0
fppp(3,3,3,1) = 0
fppp(3,3,3,2) = 0
fppp(3,3,3,3) = 0
fppu(0,0,0,0) = 0
fppu(0,0,0,1) = 0
fppu(0,0,0,2) = 0
fppu(0,0,0,3) = 0
fppu(0,0,1,0) = 0
fppu(0,0,1,1) = 0
fppu(0,0,1,2) = 0
fppu(0,0,1,3) = 0
fppu(0,0,2,0) = 0
fppu(0,0,2,1) = 0
fppu(0,0,2,2) = 0
fppu(0,0,2,3) = 0
fppu(0,0,3,0) = 0
fppu(0,0,3,1) = 0
fppu(0,0,3,2) = 0
fppu(0,0,3,3) = 0
fppu(0,1,0,0) = 0
fppu(0,1,0,1) = 0
fppu(0,1,0,2) = 0
fppu(0,1,0,3) = 0
fppu(0,1,1,0) = 0
fppu(0,1,1,1) = 0
fppu(0,1,1,2) = 0
fppu(0,1,1,3) = 0
fppu(0,1,2,0) = 0
fppu(0,1,2,1) = 0
fppu(0,1,2,2) = 0
fppu(0,1,2,3) = 0
fppu(0,1,3,0) = 0
fppu(0,1,3,1) = 0
fppu(0,1,3,2) = 0
fppu(0,1,3,3) = 0
fppu(0,2,0,0) = 0
fppu(0,2,0,1) = 0
fppu(0,2,0,2) = 0
fppu(0,2,0,3) = 0
fppu(0,2,1,0) = 0
fppu(0,2,1,1) = 0
fppu(0,2,1,2) = 0
fppu(0,2,1,3) = 0
fppu(0,2,2,0) = 0
fppu(0,2,2,1) = 0
fppu(0,2,2,2) = 0
fppu(0,2,2,3) = 0
fppu(0,2,3,0) = 0
fppu(0,2,3,1) = 0
fppu(0,2,3,2) = 0
fppu(0,2,3,3) = 0

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fppu(0,3,0,0) = 0
fppu(0,3,0,1) = 0
fppu(0,3,0,2) = 0
fppu(0,3,0,3) = 0
fppu(0,3,1,0) = 0
fppu(0,3,1,1) = 0
fppu(0,3,1,2) = 0
fppu(0,3,1,3) = 0
fppu(0,3,2,0) = 0
fppu(0,3,2,1) = 0
fppu(0,3,2,2) = 0
fppu(0,3,2,3) = 0
fppu(0,3,3,0) = 0
fppu(0,3,3,1) = 0
fppu(0,3,3,2) = 0
fppu(0,3,3,3) = 0
fppu(1,0,0,0) = (-zty(kv,jv,1)*txyddu(0,0,0)-stx(kv,jv,1)*txxddu(0
1  ,0,0))/rdj(kv,jv)
fppu(1,0,0,1) = (-zty(kv,jv,1)*txyddu(0,0,1)-stx(kv,jv,1)*txxddu(0
1  ,0,1))/rdj(kv,jv)
fppu(1,0,0,2) = (-zty(kv,jv,1)*txyddu(0,0,2)-stx(kv,jv,1)*txxddu(0
1  ,0,2))/rdj(kv,jv)
fppu(1,0,0,3) = 0
fppu(1,0,1,0) = (-zty(kv,jv,1)*txyddu(0,1,0)-stx(kv,jv,1)*txxddu(0
1  ,1,0))/rdj(kv,jv)
fppu(1,0,1,1) = 0
fppu(1,0,1,2) = 0
fppu(1,0,1,3) = 0
fppu(1,0,2,0) = (-zty(kv,jv,1)*txyddu(0,2,0)-stx(kv,jv,1)*txxddu(0
1  ,2,0))/rdj(kv,jv)
fppu(1,0,2,1) = 0
fppu(1,0,2,2) = 0
fppu(1,0,2,3) = 0
fppu(1,0,3,0) = 0
fppu(1,0,3,1) = 0
fppu(1,0,3,2) = 0
fppu(1,0,3,3) = 0
fppu(1,1,0,0) = (-zty(kv,jv,1)*txyddu(1,0,0)-stx(kv,jv,1)*txxddu(1
1  ,0,0))/rdj(kv,jv)
fppu(1,1,0,1) = 0
fppu(1,1,0,2) = 0
fppu(1,1,0,3) = 0
fppu(1,1,1,0) = 0
fppu(1,1,1,1) = 0
fppu(1,1,1,2) = 0
fppu(1,1,1,3) = 0
fppu(1,1,2,0) = 0
fppu(1,1,2,1) = 0
fppu(1,1,2,2) = 0
fppu(1,1,2,3) = 0
fppu(1,1,3,0) = 0
fppu(1,1,3,1) = 0
fppu(1,1,3,2) = 0
fppu(1,1,3,3) = 0
fppu(1,2,0,0) = (-zty(kv,jv,1)*txyddu(2,0,0)-stx(kv,jv,1)*txxddu(2
1  ,0,0))/rdj(kv,jv)
fppu(1,2,0,1) = 0
fppu(1,2,0,2) = 0
fppu(1,2,0,3) = 0

```

```

fppu(1,2,1,0) = 0
fppu(1,2,1,1) = 0
fppu(1,2,1,2) = 0
fppu(1,2,1,3) = 0
fppu(1,2,2,0) = 0
fppu(1,2,2,1) = 0
fppu(1,2,2,2) = 0
fppu(1,2,2,3) = 0
fppu(1,2,3,0) = 0
fppu(1,2,3,1) = 0
fppu(1,2,3,2) = 0
fppu(1,2,3,3) = 0
fppu(1,3,0,0) = 0
fppu(1,3,0,1) = 0
fppu(1,3,0,2) = 0
fppu(1,3,0,3) = 0
fppu(1,3,1,0) = 0
fppu(1,3,1,1) = 0
fppu(1,3,1,2) = 0
fppu(1,3,1,3) = 0
fppu(1,3,2,0) = 0
fppu(1,3,2,1) = 0
fppu(1,3,2,2) = 0
fppu(1,3,2,3) = 0
fppu(1,3,3,0) = 0
fppu(1,3,3,1) = 0
fppu(1,3,3,2) = 0
fppu(1,3,3,3) = 0
fppu(2,0,0,0) = (-zty(kv,jv,1)*tyyddu(0,0,0)-stx(kv,jv,1)*txyddu(0
1  ,0,0))/rdj(kv,jv)
fppu(2,0,0,1) = (-zty(kv,jv,1)*tyyddu(0,0,1)-stx(kv,jv,1)*txyddu(0
1  ,0,1))/rdj(kv,jv)
fppu(2,0,0,2) = (-zty(kv,jv,1)*tyyddu(0,0,2)-stx(kv,jv,1)*txyddu(0
1  ,0,2))/rdj(kv,jv)
fppu(2,0,0,3) = 0
fppu(2,0,1,0) = (-zty(kv,jv,1)*tyyddu(0,1,0)-stx(kv,jv,1)*txyddu(0
1  ,1,0))/rdj(kv,jv)
fppu(2,0,1,1) = 0
fppu(2,0,1,2) = 0
fppu(2,0,1,3) = 0
fppu(2,0,2,0) = (-zty(kv,jv,1)*tyyddu(0,2,0)-stx(kv,jv,1)*txyddu(0
1  ,2,0))/rdj(kv,jv)
fppu(2,0,2,1) = 0
fppu(2,0,2,2) = 0
fppu(2,0,2,3) = 0
fppu(2,0,3,0) = 0
fppu(2,0,3,1) = 0
fppu(2,0,3,2) = 0
fppu(2,0,3,3) = 0
fppu(2,1,0,0) = (-zty(kv,jv,1)*tyyddu(1,0,0)-stx(kv,jv,1)*txyddu(1
1  ,0,0))/rdj(kv,jv)
fppu(2,1,0,1) = 0
fppu(2,1,0,2) = 0
fppu(2,1,0,3) = 0
fppu(2,1,1,0) = 0
fppu(2,1,1,1) = 0
fppu(2,1,1,2) = 0
fppu(2,1,1,3) = 0
fppu(2,1,2,0) = 0

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```

fppu(2,1,2,1) = 0
fppu(2,1,2,2) = 0
fppu(2,1,2,3) = 0
fppu(2,1,3,0) = 0
fppu(2,1,3,1) = 0
fppu(2,1,3,2) = 0
fppu(2,1,3,3) = 0
fppu(2,2,0,0) = (-zty(kv,jv,1)*tyyddu(2,0,0)-ztx(kv,jv,1)*txyddu(2
1  ,0,0))/rdj(kv,jv)
fppu(2,2,0,1) = 0
fppu(2,2,0,2) = 0
fppu(2,2,0,3) = 0
fppu(2,2,1,0) = 0
fppu(2,2,1,1) = 0
fppu(2,2,1,2) = 0
fppu(2,2,1,3) = 0
fppu(2,2,2,0) = 0
fppu(2,2,2,1) = 0
fppu(2,2,2,2) = 0
fppu(2,2,2,3) = 0
fppu(2,2,3,0) = 0
fppu(2,2,3,1) = 0
fppu(2,2,3,2) = 0
fppu(2,2,3,3) = 0
fppu(2,3,0,0) = 0
fppu(2,3,0,1) = 0
fppu(2,3,0,2) = 0
fppu(2,3,0,3) = 0
fppu(2,3,1,0) = 0
fppu(2,3,1,1) = 0
fppu(2,3,1,2) = 0
fppu(2,3,1,3) = 0
fppu(2,3,2,0) = 0
fppu(2,3,2,1) = 0
fppu(2,3,2,2) = 0
fppu(2,3,2,3) = 0
fppu(2,3,3,0) = 0
fppu(2,3,3,1) = 0
fppu(2,3,3,2) = 0
fppu(2,3,3,3) = 0
fppu(3,0,0,0) = (-byddu(0,0,0)*zty(kv,jv,1)-bxddu(0,0,0)*ztx(kv,jv
1  ,1))/rdj(kv,jv)
fppu(3,0,0,1) = (-byddu(0,0,1)*zty(kv,jv,1)-bxddu(0,0,1)*ztx(kv,jv
1  ,1))/rdj(kv,jv)
fppu(3,0,0,2) = (-byddu(0,0,2)*zty(kv,jv,1)-bxddu(0,0,2)*ztx(kv,jv
1  ,1))/rdj(kv,jv)
fppu(3,0,0,3) = (-byddu(0,0,3)*zty(kv,jv,1)-bxddu(0,0,3)*ztx(kv,jv
1  ,1))/rdj(kv,jv)
fppu(3,0,1,0) = (-byddu(0,1,0)*zty(kv,jv,1)-bxddu(0,1,0)*ztx(kv,jv
1  ,1))/rdj(kv,jv)
fppu(3,0,1,1) = (-byddu(0,1,1)*zty(kv,jv,1)-bxddu(0,1,1)*ztx(kv,jv
1  ,1))/rdj(kv,jv)
fppu(3,0,1,2) = (-byddu(0,1,2)*zty(kv,jv,1)-bxddu(0,1,2)*ztx(kv,jv
1  ,1))/rdj(kv,jv)
fppu(3,0,1,3) = 0
fppu(3,0,2,0) = (-byddu(0,2,0)*zty(kv,jv,1)-bxddu(0,2,0)*ztx(kv,jv
1  ,1))/rdj(kv,jv)
fppu(3,0,2,1) = (-byddu(0,2,1)*zty(kv,jv,1)-bxddu(0,2,1)*ztx(kv,jv
1  ,1))/rdj(kv,jv)

```

```

fppu(3,0,2,2) = (-byddu(0,2,2)*sty(kv,jv,1)-bxddu(0,2,2)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,0,2,3) = 0
fppu(3,0,3,0) = (-byddu(0,3,0)*sty(kv,jv,1)-bxddu(0,3,0)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,0,3,1) = 0
fppu(3,0,3,2) = 0
fppu(3,0,3,3) = 0
fppu(3,1,0,0) = (-byddu(1,0,0)*sty(kv,jv,1)-bxddu(1,0,0)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,1,0,1) = (-byddu(1,0,1)*sty(kv,jv,1)-bxddu(1,0,1)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,1,0,2) = (-byddu(1,0,2)*sty(kv,jv,1)-bxddu(1,0,2)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,1,0,3) = 0
fppu(3,1,1,0) = (-byddu(1,1,0)*sty(kv,jv,1)-bxddu(1,1,0)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,1,1,1) = 0
fppu(3,1,1,2) = 0
fppu(3,1,1,3) = 0
fppu(3,1,2,0) = (-byddu(1,2,0)*sty(kv,jv,1)-bxddu(1,2,0)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,1,2,1) = 0
fppu(3,1,2,2) = 0
fppu(3,1,2,3) = 0
fppu(3,1,3,0) = 0
fppu(3,1,3,1) = 0
fppu(3,1,3,2) = 0
fppu(3,1,3,3) = 0
fppu(3,2,0,0) = (-byddu(2,0,0)*sty(kv,jv,1)-bxddu(2,0,0)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,2,0,1) = (-byddu(2,0,1)*sty(kv,jv,1)-bxddu(2,0,1)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,2,0,2) = (-byddu(2,0,2)*sty(kv,jv,1)-bxddu(2,0,2)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,2,0,3) = 0
fppu(3,2,1,0) = (-byddu(2,1,0)*sty(kv,jv,1)-bxddu(2,1,0)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,2,1,1) = 0
fppu(3,2,1,2) = 0
fppu(3,2,1,3) = 0
fppu(3,2,2,0) = (-byddu(2,2,0)*sty(kv,jv,1)-bxddu(2,2,0)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,2,2,1) = 0
fppu(3,2,2,2) = 0
fppu(3,2,2,3) = 0
fppu(3,2,3,0) = 0
fppu(3,2,3,1) = 0
fppu(3,2,3,2) = 0
fppu(3,2,3,3) = 0
fppu(3,3,0,0) = (-byddu(3,0,0)*sty(kv,jv,1)-bxddu(3,0,0)*stx(kv,jv
1,1))/rdj(kv,jv)
fppu(3,3,0,1) = 0
fppu(3,3,0,2) = 0
fppu(3,3,0,3) = 0
fppu(3,3,1,0) = 0
fppu(3,3,1,1) = 0
fppu(3,3,1,2) = 0
fppu(3,3,1,3) = 0

```

fppu(3,3,2,0) = 0
 fppu(3,3,2,1) = 0
 fppu(3,3,2,2) = 0
 fppu(3,3,2,3) = 0
 fppu(3,3,3,0) = 0
 fppu(3,3,3,1) = 0
 fppu(3,3,3,2) = 0
 fppu(3,3,3,3) = 0
 fppv(0,0,0,0) = 0
 fppv(0,0,0,1) = 0
 fppv(0,0,0,2) = 0
 fppv(0,0,0,3) = 0
 fppv(0,0,1,0) = 0
 fppv(0,0,1,1) = 0
 fppv(0,0,1,2) = 0
 fppv(0,0,1,3) = 0
 fppv(0,0,2,0) = 0
 fppv(0,0,2,1) = 0
 fppv(0,0,2,2) = 0
 fppv(0,0,2,3) = 0
 fppv(0,0,3,0) = 0
 fppv(0,0,3,1) = 0
 fppv(0,0,3,2) = 0
 fppv(0,0,3,3) = 0
 fppv(0,1,0,0) = 0
 fppv(0,1,0,1) = 0
 fppv(0,1,0,2) = 0
 fppv(0,1,0,3) = 0
 fppv(0,1,1,0) = 0
 fppv(0,1,1,1) = 0
 fppv(0,1,1,2) = 0
 fppv(0,1,1,3) = 0
 fppv(0,1,2,0) = 0
 fppv(0,1,2,1) = 0
 fppv(0,1,2,2) = 0
 fppv(0,1,2,3) = 0
 fppv(0,1,3,0) = 0
 fppv(0,1,3,1) = 0
 fppv(0,1,3,2) = 0
 fppv(0,1,3,3) = 0
 fppv(0,2,0,0) = 0
 fppv(0,2,0,1) = 0
 fppv(0,2,0,2) = 0
 fppv(0,2,0,3) = 0
 fppv(0,2,1,0) = 0
 fppv(0,2,1,1) = 0
 fppv(0,2,1,2) = 0
 fppv(0,2,1,3) = 0
 fppv(0,2,2,0) = 0
 fppv(0,2,2,1) = 0
 fppv(0,2,2,2) = 0
 fppv(0,2,2,3) = 0
 fppv(0,2,3,0) = 0
 fppv(0,2,3,1) = 0
 fppv(0,2,3,2) = 0
 fppv(0,2,3,3) = 0
 fppv(0,3,0,0) = 0
 fppv(0,3,0,1) = 0
 fppv(0,3,0,2) = 0

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fppv(0,3,0,3) = 0
fppv(0,3,1,0) = 0
fppv(0,3,1,1) = 0
fppv(0,3,1,2) = 0
fppv(0,3,1,3) = 0
fppv(0,3,2,0) = 0
fppv(0,3,2,1) = 0
fppv(0,3,2,2) = 0
fppv(0,3,2,3) = 0
fppv(0,3,3,0) = 0
fppv(0,3,3,1) = 0
fppv(0,3,3,2) = 0
fppv(0,3,3,3) = 0
fppv(1,0,0,0) = (-sty(kv,jv,1)*txyddv(0,0,0)-stx(kv,jv,1)*txxddv(0
1  ,0,0))/rdj(kv,jv)
fppv(1,0,0,1) = (-sty(kv,jv,1)*txyddv(0,0,1)-stx(kv,jv,1)*txxddv(0
1  ,0,1))/rdj(kv,jv)
fppv(1,0,0,2) = (-sty(kv,jv,1)*txyddv(0,0,2)-stx(kv,jv,1)*txxddv(0
1  ,0,2))/rdj(kv,jv)
fppv(1,0,0,3) = 0
fppv(1,0,1,0) = (-sty(kv,jv,1)*txyddv(0,1,0)-stx(kv,jv,1)*txxddv(0
1  ,1,0))/rdj(kv,jv)
fppv(1,0,1,1) = 0
fppv(1,0,1,2) = 0
fppv(1,0,1,3) = 0
fppv(1,0,2,0) = (-sty(kv,jv,1)*txyddv(0,2,0)-stx(kv,jv,1)*txxddv(0
1  ,2,0))/rdj(kv,jv)
fppv(1,0,2,1) = 0
fppv(1,0,2,2) = 0
fppv(1,0,2,3) = 0
fppv(1,0,3,0) = 0
fppv(1,0,3,1) = 0
fppv(1,0,3,2) = 0
fppv(1,0,3,3) = 0
fppv(1,1,0,0) = (-sty(kv,jv,1)*txyddv(1,0,0)-stx(kv,jv,1)*txxddv(1
1  ,0,0))/rdj(kv,jv)
fppv(1,1,0,1) = 0
fppv(1,1,0,2) = 0
fppv(1,1,0,3) = 0
fppv(1,1,1,0) = 0
fppv(1,1,1,1) = 0
fppv(1,1,1,2) = 0
fppv(1,1,1,3) = 0
fppv(1,1,2,0) = 0
fppv(1,1,2,1) = 0
fppv(1,1,2,2) = 0
fppv(1,1,2,3) = 0
fppv(1,1,3,0) = 0
fppv(1,1,3,1) = 0
fppv(1,1,3,2) = 0
fppv(1,1,3,3) = 0
fppv(1,2,0,0) = (-sty(kv,jv,1)*txyddv(2,0,0)-stx(kv,jv,1)*txxddv(2
1  ,0,0))/rdj(kv,jv)
fppv(1,2,0,1) = 0
fppv(1,2,0,2) = 0
fppv(1,2,0,3) = 0
fppv(1,2,1,0) = 0
fppv(1,2,1,1) = 0
fppv(1,2,1,2) = 0

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fppv(1,2,1,3) = 0
fppv(1,2,2,0) = 0
fppv(1,2,2,1) = 0
fppv(1,2,2,2) = 0
fppv(1,2,2,3) = 0
fppv(1,2,3,0) = 0
fppv(1,2,3,1) = 0
fppv(1,2,3,2) = 0
fppv(1,2,3,3) = 0
fppv(1,3,0,0) = 0
fppv(1,3,0,1) = 0
fppv(1,3,0,2) = 0
fppv(1,3,0,3) = 0
fppv(1,3,1,0) = 0
fppv(1,3,1,1) = 0
fppv(1,3,1,2) = 0
fppv(1,3,1,3) = 0
fppv(1,3,2,0) = 0
fppv(1,3,2,1) = 0
fppv(1,3,2,2) = 0
fppv(1,3,2,3) = 0
fppv(1,3,3,0) = 0
fppv(1,3,3,1) = 0
fppv(1,3,3,2) = 0
fppv(1,3,3,3) = 0
fppv(2,0,0,0) = (-sty(kv,jv,1)*tyyddv(0,0,0)-stx(kv,jv,1)*txyddv(0
1  ,0,0))/rdj(kv,jv)
fppv(2,0,0,1) = (-sty(kv,jv,1)*tyyddv(0,0,1)-stx(kv,jv,1)*txyddv(0
1  ,0,1))/rdj(kv,jv)
fppv(2,0,0,2) = (-sty(kv,jv,1)*tyyddv(0,0,2)-stx(kv,jv,1)*txyddv(0
1  ,0,2))/rdj(kv,jv)
fppv(2,0,0,3) = 0
fppv(2,0,1,0) = (-sty(kv,jv,1)*tyyddv(0,1,0)-stx(kv,jv,1)*txyddv(0
1  ,1,0))/rdj(kv,jv)
fppv(2,0,1,1) = 0
fppv(2,0,1,2) = 0
fppv(2,0,1,3) = 0
fppv(2,0,2,0) = (-sty(kv,jv,1)*tyyddv(0,2,0)-stx(kv,jv,1)*txyddv(0
1  ,2,0))/rdj(kv,jv)
fppv(2,0,2,1) = 0
fppv(2,0,2,2) = 0
fppv(2,0,2,3) = 0
fppv(2,0,3,0) = 0
fppv(2,0,3,1) = 0
fppv(2,0,3,2) = 0
fppv(2,0,3,3) = 0
fppv(2,1,0,0) = (-sty(kv,jv,1)*tyyddv(1,0,0)-stx(kv,jv,1)*txyddv(1
1  ,0,0))/rdj(kv,jv)
fppv(2,1,0,1) = 0
fppv(2,1,0,2) = 0
fppv(2,1,0,3) = 0
fppv(2,1,1,0) = 0
fppv(2,1,1,1) = 0
fppv(2,1,1,2) = 0
fppv(2,1,1,3) = 0
fppv(2,1,2,0) = 0
fppv(2,1,2,1) = 0
fppv(2,1,2,2) = 0
fppv(2,1,2,3) = 0

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```

fppv(2,1,3,0) = 0
fppv(2,1,3,1) = 0
fppv(2,1,3,2) = 0
fppv(2,1,3,3) = 0
fppv(2,2,0,0) = (-sty(kv,jv,1)*tyyddv(2,0,0)-stx(kv,jv,1)*txyddv(2
1,0,0))/rdj(kv,jv)
fppv(2,2,0,1) = 0
fppv(2,2,0,2) = 0
fppv(2,2,0,3) = 0
fppv(2,2,1,0) = 0
fppv(2,2,1,1) = 0
fppv(2,2,1,2) = 0
fppv(2,2,1,3) = 0
fppv(2,2,2,0) = 0
fppv(2,2,2,1) = 0
fppv(2,2,2,2) = 0
fppv(2,2,2,3) = 0
fppv(2,2,3,0) = 0
fppv(2,2,3,1) = 0
fppv(2,2,3,2) = 0
fppv(2,2,3,3) = 0
fppv(2,3,0,0) = 0
fppv(2,3,0,1) = 0
fppv(2,3,0,2) = 0
fppv(2,3,0,3) = 0
fppv(2,3,1,0) = 0
fppv(2,3,1,1) = 0
fppv(2,3,1,2) = 0
fppv(2,3,1,3) = 0
fppv(2,3,2,0) = 0
fppv(2,3,2,1) = 0
fppv(2,3,2,2) = 0
fppv(2,3,2,3) = 0
fppv(2,3,3,0) = 0
fppv(2,3,3,1) = 0
fppv(2,3,3,2) = 0
fppv(2,3,3,3) = 0
fppv(3,0,0,0) = (-byddv(0,0,0)*sty(kv,jv,1)-bxddv(0,0,0)*stx(kv,jv
1,1))/rdj(kv,jv)
fppv(3,0,0,1) = (-byddv(0,0,1)*sty(kv,jv,1)-bxddv(0,0,1)*stx(kv,jv
1,1))/rdj(kv,jv)
fppv(3,0,0,2) = (-byddv(0,0,2)*sty(kv,jv,1)-bxddv(0,0,2)*stx(kv,jv
1,1))/rdj(kv,jv)
fppv(3,0,0,3) = (-byddv(0,0,3)*sty(kv,jv,1)-bxddv(0,0,3)*stx(kv,jv
1,1))/rdj(kv,jv)
fppv(3,0,1,0) = (-byddv(0,1,0)*sty(kv,jv,1)-bxddv(0,1,0)*stx(kv,jv
1,1))/rdj(kv,jv)
fppv(3,0,1,1) = (-byddv(0,1,1)*sty(kv,jv,1)-bxddv(0,1,1)*stx(kv,jv
1,1))/rdj(kv,jv)
fppv(3,0,1,2) = (-byddv(0,1,2)*sty(kv,jv,1)-bxddv(0,1,2)*stx(kv,jv
1,1))/rdj(kv,jv)
fppv(3,0,1,3) = 0
fppv(3,0,2,0) = (-byddv(0,2,0)*sty(kv,jv,1)-bxddv(0,2,0)*stx(kv,jv
1,1))/rdj(kv,jv)
fppv(3,0,2,1) = (-byddv(0,2,1)*sty(kv,jv,1)-bxddv(0,2,1)*stx(kv,jv
1,1))/rdj(kv,jv)
fppv(3,0,2,2) = (-byddv(0,2,2)*sty(kv,jv,1)-bxddv(0,2,2)*stx(kv,jv
1,1))/rdj(kv,jv)
fppv(3,0,2,3) = 0

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fppv(3,0,3,0) = (-byddv(0,3,0)*sty(kv,jv,1)-bxddv(0,3,0)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,0,3,1) = 0
fppv(3,0,3,2) = 0
fppv(3,0,3,3) = 0
fppv(3,1,0,0) = (-byddv(1,0,0)*sty(kv,jv,1)-bxddv(1,0,0)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,1,0,1) = (-byddv(1,0,1)*sty(kv,jv,1)-bxddv(1,0,1)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,1,0,2) = (-byddv(1,0,2)*sty(kv,jv,1)-bxddv(1,0,2)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,1,0,3) = 0
fppv(3,1,1,0) = (-byddv(1,1,0)*sty(kv,jv,1)-bxddv(1,1,0)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,1,1,1) = 0
fppv(3,1,1,2) = 0
fppv(3,1,1,3) = 0
fppv(3,1,2,0) = (-byddv(1,2,0)*sty(kv,jv,1)-bxddv(1,2,0)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,1,2,1) = 0
fppv(3,1,2,2) = 0
fppv(3,1,2,3) = 0
fppv(3,1,3,0) = 0
fppv(3,1,3,1) = 0
fppv(3,1,3,2) = 0
fppv(3,1,3,3) = 0
fppv(3,2,0,0) = (-byddv(2,0,0)*sty(kv,jv,1)-bxddv(2,0,0)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,2,0,1) = (-byddv(2,0,1)*sty(kv,jv,1)-bxddv(2,0,1)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,2,0,2) = (-byddv(2,0,2)*sty(kv,jv,1)-bxddv(2,0,2)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,2,0,3) = 0
fppv(3,2,1,0) = (-byddv(2,1,0)*sty(kv,jv,1)-bxddv(2,1,0)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,2,1,1) = 0
fppv(3,2,1,2) = 0
fppv(3,2,1,3) = 0
fppv(3,2,2,0) = (-byddv(2,2,0)*sty(kv,jv,1)-bxddv(2,2,0)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,2,2,1) = 0
fppv(3,2,2,2) = 0
fppv(3,2,2,3) = 0
fppv(3,2,3,0) = 0
fppv(3,2,3,1) = 0
fppv(3,2,3,2) = 0
fppv(3,2,3,3) = 0
fppv(3,3,0,0) = (-byddv(3,0,0)*sty(kv,jv,1)-bxddv(3,0,0)*stx(kv,jv
1 ,1))/rdj(kv,jv)
fppv(3,3,0,1) = 0
fppv(3,3,0,2) = 0
fppv(3,3,0,3) = 0
fppv(3,3,1,0) = 0
fppv(3,3,1,1) = 0
fppv(3,3,1,2) = 0
fppv(3,3,1,3) = 0
fppv(3,3,2,0) = 0
fppv(3,3,2,1) = 0
fppv(3,3,2,2) = 0

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fppv(3,3,2,3) = 0
 fppv(3,3,3,0) = 0
 fppv(3,3,3,1) = 0
 fppv(3,3,3,2) = 0
 fppv(3,3,3,3) = 0
 fpup(0,0,0,0) = 0
 fpup(0,0,0,1) = 0
 fpup(0,0,0,2) = 0
 fpup(0,0,0,3) = 0
 fpup(0,0,1,0) = 0
 fpup(0,0,1,1) = 0
 fpup(0,0,1,2) = 0
 fpup(0,0,1,3) = 0
 fpup(0,0,2,0) = 0
 fpup(0,0,2,1) = 0
 fpup(0,0,2,2) = 0
 fpup(0,0,2,3) = 0
 fpup(0,0,3,0) = 0
 fpup(0,0,3,1) = 0
 fpup(0,0,3,2) = 0
 fpup(0,0,3,3) = 0
 fpup(0,1,0,0) = 0
 fpup(0,1,0,1) = 0
 fpup(0,1,0,2) = 0
 fpup(0,1,0,3) = 0
 fpup(0,1,1,0) = 0
 fpup(0,1,1,1) = 0
 fpup(0,1,1,2) = 0
 fpup(0,1,1,3) = 0
 fpup(0,1,2,0) = 0
 fpup(0,1,2,1) = 0
 fpup(0,1,2,2) = 0
 fpup(0,1,2,3) = 0
 fpup(0,1,3,0) = 0
 fpup(0,1,3,1) = 0
 fpup(0,1,3,2) = 0
 fpup(0,1,3,3) = 0
 fpup(0,2,0,0) = 0
 fpup(0,2,0,1) = 0
 fpup(0,2,0,2) = 0
 fpup(0,2,0,3) = 0
 fpup(0,2,1,0) = 0
 fpup(0,2,1,1) = 0
 fpup(0,2,1,2) = 0
 fpup(0,2,1,3) = 0
 fpup(0,2,2,0) = 0
 fpup(0,2,2,1) = 0
 fpup(0,2,2,2) = 0
 fpup(0,2,2,3) = 0
 fpup(0,2,3,0) = 0
 fpup(0,2,3,1) = 0
 fpup(0,2,3,2) = 0
 fpup(0,2,3,3) = 0
 fpup(0,3,0,0) = 0
 fpup(0,3,0,1) = 0
 fpup(0,3,0,2) = 0
 fpup(0,3,0,3) = 0
 fpup(0,3,1,0) = 0
 fpup(0,3,1,1) = 0

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fpup(0,3,1,2) = 0
fpup(0,3,1,3) = 0
fpup(0,3,2,0) = 0
fpup(0,3,2,1) = 0
fpup(0,3,2,2) = 0
fpup(0,3,2,3) = 0
fpup(0,3,3,0) = 0
fpup(0,3,3,1) = 0
fpup(0,3,3,2) = 0
fpup(0,3,3,3) = 0
fpup(1,0,0,0) = (-zty(kv,jv,1)*txydud(0,0,0)-stx(kv,jv,1)*txxdud(0
1  ,0,0))/rdj(kv,jv)
fpup(1,0,0,1) = (-zty(kv,jv,1)*txydud(0,0,1)-stx(kv,jv,1)*txxdud(0
1  ,0,1))/rdj(kv,jv)
fpup(1,0,0,2) = (-zty(kv,jv,1)*txydud(0,0,2)-stx(kv,jv,1)*txxdud(0
1  ,0,2))/rdj(kv,jv)
fpup(1,0,0,3) = 0
fpup(1,0,1,0) = (-zty(kv,jv,1)*txydud(0,1,0)-stx(kv,jv,1)*txxdud(0
1  ,1,0))/rdj(kv,jv)
fpup(1,0,1,1) = 0
fpup(1,0,1,2) = 0
fpup(1,0,1,3) = 0
fpup(1,0,2,0) = (-zty(kv,jv,1)*txydud(0,2,0)-stx(kv,jv,1)*txxdud(0
1  ,2,0))/rdj(kv,jv)
fpup(1,0,2,1) = 0
fpup(1,0,2,2) = 0
fpup(1,0,2,3) = 0
fpup(1,0,3,0) = 0
fpup(1,0,3,1) = 0
fpup(1,0,3,2) = 0
fpup(1,0,3,3) = 0
fpup(1,1,0,0) = (-zty(kv,jv,1)*txydud(1,0,0)-stx(kv,jv,1)*txxdud(1
1  ,0,0))/rdj(kv,jv)
fpup(1,1,0,1) = 0
fpup(1,1,0,2) = 0
fpup(1,1,0,3) = 0
fpup(1,1,1,0) = 0
fpup(1,1,1,1) = 0
fpup(1,1,1,2) = 0
fpup(1,1,1,3) = 0
fpup(1,1,2,0) = 0
fpup(1,1,2,1) = 0
fpup(1,1,2,2) = 0
fpup(1,1,2,3) = 0
fpup(1,1,3,0) = 0
fpup(1,1,3,1) = 0
fpup(1,1,3,2) = 0
fpup(1,1,3,3) = 0
fpup(1,2,0,0) = (-zty(kv,jv,1)*txydud(2,0,0)-stx(kv,jv,1)*txxdud(2
1  ,0,0))/rdj(kv,jv)
fpup(1,2,0,1) = 0
fpup(1,2,0,2) = 0
fpup(1,2,0,3) = 0
fpup(1,2,1,0) = 0
fpup(1,2,1,1) = 0
fpup(1,2,1,2) = 0
fpup(1,2,1,3) = 0
fpup(1,2,2,0) = 0
fpup(1,2,2,1) = 0

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fpup(1,2,2,2) = 0
fpup(1,2,2,3) = 0
fpup(1,2,3,0) = 0
fpup(1,2,3,1) = 0
fpup(1,2,3,2) = 0
fpup(1,2,3,3) = 0
fpup(1,3,0,0) = 0
fpup(1,3,0,1) = 0
fpup(1,3,0,2) = 0
fpup(1,3,0,3) = 0
fpup(1,3,1,0) = 0
fpup(1,3,1,1) = 0
fpup(1,3,1,2) = 0
fpup(1,3,1,3) = 0
fpup(1,3,2,0) = 0
fpup(1,3,2,1) = 0
fpup(1,3,2,2) = 0
fpup(1,3,2,3) = 0
fpup(1,3,3,0) = 0
fpup(1,3,3,1) = 0
fpup(1,3,3,2) = 0
fpup(1,3,3,3) = 0
fpup(2,0,0,0) = (-zty(kv,jv,1)*tyydud(0,0,0)-stx(kv,jv,1)*txydud(0
1  ,0,0))/rdj(kv,jv)
fpup(2,0,0,1) = (-zty(kv,jv,1)*tyydud(0,0,1)-stx(kv,jv,1)*txydud(0
1  ,0,1))/rdj(kv,jv)
fpup(2,0,0,2) = (-zty(kv,jv,1)*tyydud(0,0,2)-stx(kv,jv,1)*txydud(0
1  ,0,2))/rdj(kv,jv)
fpup(2,0,0,3) = 0
fpup(2,0,1,0) = (-zty(kv,jv,1)*tyydud(0,1,0)-stx(kv,jv,1)*txydud(0
1  ,1,0))/rdj(kv,jv)
fpup(2,0,1,1) = 0
fpup(2,0,1,2) = 0
fpup(2,0,1,3) = 0
fpup(2,0,2,0) = (-zty(kv,jv,1)*tyydud(0,2,0)-stx(kv,jv,1)*txydud(0
1  ,2,0))/rdj(kv,jv)
fpup(2,0,2,1) = 0
fpup(2,0,2,2) = 0
fpup(2,0,2,3) = 0
fpup(2,0,3,0) = 0
fpup(2,0,3,1) = 0
fpup(2,0,3,2) = 0
fpup(2,0,3,3) = 0
fpup(2,1,0,0) = (-zty(kv,jv,1)*tyydud(1,0,0)-stx(kv,jv,1)*txydud(1
1  ,0,0))/rdj(kv,jv)
fpup(2,1,0,1) = 0
fpup(2,1,0,2) = 0
fpup(2,1,0,3) = 0
fpup(2,1,1,0) = 0
fpup(2,1,1,1) = 0
fpup(2,1,1,2) = 0
fpup(2,1,1,3) = 0
fpup(2,1,2,0) = 0
fpup(2,1,2,1) = 0
fpup(2,1,2,2) = 0
fpup(2,1,2,3) = 0
fpup(2,1,3,0) = 0
fpup(2,1,3,1) = 0
fpup(2,1,3,2) = 0

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fpup(2,1,3,3) = 0
fpup(2,2,0,0) = (-sty(kv,jv,1)*tyydud(2,0,0)-stx(kv,jv,1)*txydud(2
1  ,0,0))/rdj(kv,jv)
fpup(2,2,0,1) = 0
fpup(2,2,0,2) = 0
fpup(2,2,0,3) = 0
fpup(2,2,1,0) = 0
fpup(2,2,1,1) = 0
fpup(2,2,1,2) = 0
fpup(2,2,1,3) = 0
fpup(2,2,2,0) = 0
fpup(2,2,2,1) = 0
fpup(2,2,2,2) = 0
fpup(2,2,2,3) = 0
fpup(2,2,3,0) = 0
fpup(2,2,3,1) = 0
fpup(2,2,3,2) = 0
fpup(2,2,3,3) = 0
fpup(2,3,0,0) = 0
fpup(2,3,0,1) = 0
fpup(2,3,0,2) = 0
fpup(2,3,0,3) = 0
fpup(2,3,1,0) = 0
fpup(2,3,1,1) = 0
fpup(2,3,1,2) = 0
fpup(2,3,1,3) = 0
fpup(2,3,2,0) = 0
fpup(2,3,2,1) = 0
fpup(2,3,2,2) = 0
fpup(2,3,2,3) = 0
fpup(2,3,3,0) = 0
fpup(2,3,3,1) = 0
fpup(2,3,3,2) = 0
fpup(2,3,3,3) = 0
fpup(3,0,0,0) = (-bydud(0,0,0)*sty(kv,jv,1)-bxdud(0,0,0)*stx(kv,jv
1  ,1))/rdj(kv,jv)
fpup(3,0,0,1) = (-bydud(0,0,1)*sty(kv,jv,1)-bxdud(0,0,1)*stx(kv,jv
1  ,1))/rdj(kv,jv)
fpup(3,0,0,2) = (-bydud(0,0,2)*sty(kv,jv,1)-bxdud(0,0,2)*stx(kv,jv
1  ,1))/rdj(kv,jv)
fpup(3,0,0,3) = (-bydud(0,0,3)*sty(kv,jv,1)-bxdud(0,0,3)*stx(kv,jv
1  ,1))/rdj(kv,jv)
fpup(3,0,1,0) = (-bydud(0,1,0)*sty(kv,jv,1)-bxdud(0,1,0)*stx(kv,jv
1  ,1))/rdj(kv,jv)
fpup(3,0,1,1) = (-bydud(0,1,1)*sty(kv,jv,1)-bxdud(0,1,1)*stx(kv,jv
1  ,1))/rdj(kv,jv)
fpup(3,0,1,2) = (-bydud(0,1,2)*sty(kv,jv,1)-bxdud(0,1,2)*stx(kv,jv
1  ,1))/rdj(kv,jv)
fpup(3,0,1,3) = 0
fpup(3,0,2,0) = (-bydud(0,2,0)*sty(kv,jv,1)-bxdud(0,2,0)*stx(kv,jv
1  ,1))/rdj(kv,jv)
fpup(3,0,2,1) = (-bydud(0,2,1)*sty(kv,jv,1)-bxdud(0,2,1)*stx(kv,jv
1  ,1))/rdj(kv,jv)
fpup(3,0,2,2) = (-bydud(0,2,2)*sty(kv,jv,1)-bxdud(0,2,2)*stx(kv,jv
1  ,1))/rdj(kv,jv)
fpup(3,0,2,3) = 0
fpup(3,0,3,0) = (-bydud(0,3,0)*sty(kv,jv,1)-bxdud(0,3,0)*stx(kv,jv
1  ,1))/rdj(kv,jv)
fpup(3,0,3,1) = 0

```

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fpup(3,0,3,2) = 0
fpup(3,0,3,3) = 0
fpup(3,1,0,0) = (-bydud(1,0,0)*zty(kv,jv,1)-bxdud(1,0,0)*ztx(kv,jv
1 ,1))/rdj(kv,jv)
fpup(3,1,0,1) = (-bydud(1,0,1)*zty(kv,jv,1)-bxdud(1,0,1)*ztx(kv,jv
1 ,1))/rdj(kv,jv)
fpup(3,1,0,2) = (-bydud(1,0,2)*zty(kv,jv,1)-bxdud(1,0,2)*ztx(kv,jv
1 ,1))/rdj(kv,jv)
fpup(3,1,0,3) = 0
fpup(3,1,1,0) = (-bydud(1,1,0)*zty(kv,jv,1)-bxdud(1,1,0)*ztx(kv,jv
1 ,1))/rdj(kv,jv)
fpup(3,1,1,1) = 0
fpup(3,1,1,2) = 0
fpup(3,1,1,3) = 0
fpup(3,1,2,0) = (-bydud(1,2,0)*zty(kv,jv,1)-bxdud(1,2,0)*ztx(kv,jv
1 ,1))/rdj(kv,jv)
fpup(3,1,2,1) = 0
fpup(3,1,2,2) = 0
fpup(3,1,2,3) = 0
fpup(3,1,3,0) = 0
fpup(3,1,3,1) = 0
fpup(3,1,3,2) = 0
fpup(3,1,3,3) = 0
fpup(3,2,0,0) = (-bydud(2,0,0)*zty(kv,jv,1)-bxdud(2,0,0)*ztx(kv,jv
1 ,1))/rdj(kv,jv)
fpup(3,2,0,1) = (-bydud(2,0,1)*zty(kv,jv,1)-bxdud(2,0,1)*ztx(kv,jv
1 ,1))/rdj(kv,jv)
fpup(3,2,0,2) = (-bydud(2,0,2)*zty(kv,jv,1)-bxdud(2,0,2)*ztx(kv,jv
1 ,1))/rdj(kv,jv)
fpup(3,2,0,3) = 0
fpup(3,2,1,0) = (-bydud(2,1,0)*zty(kv,jv,1)-bxdud(2,1,0)*ztx(kv,jv
1 ,1))/rdj(kv,jv)
fpup(3,2,1,1) = 0
fpup(3,2,1,2) = 0
fpup(3,2,1,3) = 0
fpup(3,2,2,0) = (-bydud(2,2,0)*zty(kv,jv,1)-bxdud(2,2,0)*ztx(kv,jv
1 ,1))/rdj(kv,jv)
fpup(3,2,2,1) = 0
fpup(3,2,2,2) = 0
fpup(3,2,2,3) = 0
fpup(3,2,3,0) = 0
fpup(3,2,3,1) = 0
fpup(3,2,3,2) = 0
fpup(3,2,3,3) = 0
fpup(3,3,0,0) = (-bydud(3,0,0)*zty(kv,jv,1)-bxdud(3,0,0)*ztx(kv,jv
1 ,1))/rdj(kv,jv)
fpup(3,3,0,1) = 0
fpup(3,3,0,2) = 0
fpup(3,3,0,3) = 0
fpup(3,3,1,0) = 0
fpup(3,3,1,1) = 0
fpup(3,3,1,2) = 0
fpup(3,3,1,3) = 0
fpup(3,3,2,0) = 0
fpup(3,3,2,1) = 0
fpup(3,3,2,2) = 0
fpup(3,3,2,3) = 0
fpup(3,3,3,0) = 0
fpup(3,3,3,1) = 0

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fpup(3,3,3,2) = 0
 fpup(3,3,3,3) = 0
 fpvp(0,0,0,0) = 0
 fpvp(0,0,0,1) = 0
 fpvp(0,0,0,2) = 0
 fpvp(0,0,0,3) = 0
 fpvp(0,0,1,0) = 0
 fpvp(0,0,1,1) = 0
 fpvp(0,0,1,2) = 0
 fpvp(0,0,1,3) = 0
 fpvp(0,0,2,0) = 0
 fpvp(0,0,2,1) = 0
 fpvp(0,0,2,2) = 0
 fpvp(0,0,2,3) = 0
 fpvp(0,0,3,0) = 0
 fpvp(0,0,3,1) = 0
 fpvp(0,0,3,2) = 0
 fpvp(0,0,3,3) = 0
 fpvp(0,1,0,0) = 0
 fpvp(0,1,0,1) = 0
 fpvp(0,1,0,2) = 0
 fpvp(0,1,0,3) = 0
 fpvp(0,1,1,0) = 0
 fpvp(0,1,1,1) = 0
 fpvp(0,1,1,2) = 0
 fpvp(0,1,1,3) = 0
 fpvp(0,1,2,0) = 0
 fpvp(0,1,2,1) = 0
 fpvp(0,1,2,2) = 0
 fpvp(0,1,2,3) = 0
 fpvp(0,1,3,0) = 0
 fpvp(0,1,3,1) = 0
 fpvp(0,1,3,2) = 0
 fpvp(0,1,3,3) = 0
 fpvp(0,2,0,0) = 0
 fpvp(0,2,0,1) = 0
 fpvp(0,2,0,2) = 0
 fpvp(0,2,0,3) = 0
 fpvp(0,2,1,0) = 0
 fpvp(0,2,1,1) = 0
 fpvp(0,2,1,2) = 0
 fpvp(0,2,1,3) = 0
 fpvp(0,2,2,0) = 0
 fpvp(0,2,2,1) = 0
 fpvp(0,2,2,2) = 0
 fpvp(0,2,2,3) = 0
 fpvp(0,2,3,0) = 0
 fpvp(0,2,3,1) = 0
 fpvp(0,2,3,2) = 0
 fpvp(0,2,3,3) = 0
 fpvp(0,3,0,0) = 0
 fpvp(0,3,0,1) = 0
 fpvp(0,3,0,2) = 0
 fpvp(0,3,0,3) = 0
 fpvp(0,3,1,0) = 0
 fpvp(0,3,1,1) = 0
 fpvp(0,3,1,2) = 0
 fpvp(0,3,1,3) = 0
 fpvp(0,3,2,0) = 0

```

fpvp(0,3,2,1) = 0
fpvp(0,3,2,2) = 0
fpvp(0,3,2,3) = 0
fpvp(0,3,3,0) = 0
fpvp(0,3,3,1) = 0
fpvp(0,3,3,2) = 0
fpvp(0,3,3,3) = 0
fpvp(1,0,0,0) = (-sty(kv,jv,1)*txydvd(0,0,0)-stx(kv,jv,1)*txxdvd(0
1  ,0,0))/rdj(kv,jv)
fpvp(1,0,0,1) = (-sty(kv,jv,1)*txydvd(0,0,1)-stx(kv,jv,1)*txxdvd(0
1  ,0,1))/rdj(kv,jv)
fpvp(1,0,0,2) = (-sty(kv,jv,1)*txydvd(0,0,2)-stx(kv,jv,1)*txxdvd(0
1  ,0,2))/rdj(kv,jv)
fpvp(1,0,0,3) = 0
fpvp(1,0,1,0) = (-sty(kv,jv,1)*txydvd(0,1,0)-stx(kv,jv,1)*txxdvd(0
1  ,1,0))/rdj(kv,jv)
fpvp(1,0,1,1) = 0
fpvp(1,0,1,2) = 0
fpvp(1,0,1,3) = 0
fpvp(1,0,2,0) = (-sty(kv,jv,1)*txydvd(0,2,0)-stx(kv,jv,1)*txxdvd(0
1  ,2,0))/rdj(kv,jv)
fpvp(1,0,2,1) = 0
fpvp(1,0,2,2) = 0
fpvp(1,0,2,3) = 0
fpvp(1,0,3,0) = 0
fpvp(1,0,3,1) = 0
fpvp(1,0,3,2) = 0
fpvp(1,0,3,3) = 0
fpvp(1,1,0,0) = (-sty(kv,jv,1)*txydvd(1,0,0)-stx(kv,jv,1)*txxdvd(1
1  ,0,0))/rdj(kv,jv)
fpvp(1,1,0,1) = 0
fpvp(1,1,0,2) = 0
fpvp(1,1,0,3) = 0
fpvp(1,1,1,0) = 0
fpvp(1,1,1,1) = 0
fpvp(1,1,1,2) = 0
fpvp(1,1,1,3) = 0
fpvp(1,1,2,0) = 0
fpvp(1,1,2,1) = 0
fpvp(1,1,2,2) = 0
fpvp(1,1,2,3) = 0
fpvp(1,1,3,0) = 0
fpvp(1,1,3,1) = 0
fpvp(1,1,3,2) = 0
fpvp(1,1,3,3) = 0
fpvp(1,2,0,0) = (-sty(kv,jv,1)*txydvd(2,0,0)-stx(kv,jv,1)*txxdvd(2
1  ,0,0))/rdj(kv,jv)
fpvp(1,2,0,1) = 0
fpvp(1,2,0,2) = 0
fpvp(1,2,0,3) = 0
fpvp(1,2,1,0) = 0
fpvp(1,2,1,1) = 0
fpvp(1,2,1,2) = 0
fpvp(1,2,1,3) = 0
fpvp(1,2,2,0) = 0
fpvp(1,2,2,1) = 0
fpvp(1,2,2,2) = 0
fpvp(1,2,2,3) = 0
fpvp(1,2,3,0) = 0

```



```

fpvp(1,2,3,1) = 0
fpvp(1,2,3,2) = 0
fpvp(1,2,3,3) = 0
fpvp(1,3,0,0) = 0
fpvp(1,3,0,1) = 0
fpvp(1,3,0,2) = 0
fpvp(1,3,0,3) = 0
fpvp(1,3,1,0) = 0
fpvp(1,3,1,1) = 0
fpvp(1,3,1,2) = 0
fpvp(1,3,1,3) = 0
fpvp(1,3,2,0) = 0
fpvp(1,3,2,1) = 0
fpvp(1,3,2,2) = 0
fpvp(1,3,2,3) = 0
fpvp(1,3,3,0) = 0
fpvp(1,3,3,1) = 0
fpvp(1,3,3,2) = 0
fpvp(1,3,3,3) = 0
fpvp(2,0,0,0) = (-sty(kv,jv,1)*tyydvd(0,0,0)-stx(kv,jv,1)*txydvd(0
1  ,0,0))/rdj(kv,jv)
fpvp(2,0,0,1) = (-sty(kv,jv,1)*tyydvd(0,0,1)-stx(kv,jv,1)*txydvd(0
1  ,0,1))/rdj(kv,jv)
fpvp(2,0,0,2) = (-sty(kv,jv,1)*tyydvd(0,0,2)-stx(kv,jv,1)*txydvd(0
1  ,0,2))/rdj(kv,jv)
fpvp(2,0,0,3) = 0
fpvp(2,0,1,0) = (-sty(kv,jv,1)*tyydvd(0,1,0)-stx(kv,jv,1)*txydvd(0
1  ,1,0))/rdj(kv,jv)
fpvp(2,0,1,1) = 0
fpvp(2,0,1,2) = 0
fpvp(2,0,1,3) = 0
fpvp(2,0,2,0) = (-sty(kv,jv,1)*tyydvd(0,2,0)-stx(kv,jv,1)*txydvd(0
1  ,2,0))/rdj(kv,jv)
fpvp(2,0,2,1) = 0
fpvp(2,0,2,2) = 0
fpvp(2,0,2,3) = 0
fpvp(2,0,3,0) = 0
fpvp(2,0,3,1) = 0
fpvp(2,0,3,2) = 0
fpvp(2,0,3,3) = 0
fpvp(2,1,0,0) = (-sty(kv,jv,1)*tyydvd(1,0,0)-stx(kv,jv,1)*txydvd(1
1  ,0,0))/rdj(kv,jv)
fpvp(2,1,0,1) = 0
fpvp(2,1,0,2) = 0
fpvp(2,1,0,3) = 0
fpvp(2,1,1,0) = 0
fpvp(2,1,1,1) = 0
fpvp(2,1,1,2) = 0
fpvp(2,1,1,3) = 0
fpvp(2,1,2,0) = 0
fpvp(2,1,2,1) = 0
fpvp(2,1,2,2) = 0
fpvp(2,1,2,3) = 0
fpvp(2,1,3,0) = 0
fpvp(2,1,3,1) = 0
fpvp(2,1,3,2) = 0
fpvp(2,1,3,3) = 0
fpvp(2,2,0,0) = (-sty(kv,jv,1)*tyydvd(2,0,0)-stx(kv,jv,1)*txydvd(2
1  ,0,0))/rdj(kv,jv)

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fpvp(2,2,0,1) = 0
fpvp(2,2,0,2) = 0
fpvp(2,2,0,3) = 0
fpvp(2,2,1,0) = 0
fpvp(2,2,1,1) = 0
fpvp(2,2,1,2) = 0
fpvp(2,2,1,3) = 0
fpvp(2,2,2,0) = 0
fpvp(2,2,2,1) = 0
fpvp(2,2,2,2) = 0
fpvp(2,2,2,3) = 0
fpvp(2,2,3,0) = 0
fpvp(2,2,3,1) = 0
fpvp(2,2,3,2) = 0
fpvp(2,2,3,3) = 0
fpvp(2,3,0,0) = 0
fpvp(2,3,0,1) = 0
fpvp(2,3,0,2) = 0
fpvp(2,3,0,3) = 0
fpvp(2,3,1,0) = 0
fpvp(2,3,1,1) = 0
fpvp(2,3,1,2) = 0
fpvp(2,3,1,3) = 0
fpvp(2,3,2,0) = 0
fpvp(2,3,2,1) = 0
fpvp(2,3,2,2) = 0
fpvp(2,3,2,3) = 0
fpvp(2,3,3,0) = 0
fpvp(2,3,3,1) = 0
fpvp(2,3,3,2) = 0
fpvp(2,3,3,3) = 0
fpvp(3,0,0,0) = (-bydvd(0,0,0)*zty(kv,jv,1)-bxdvd(0,0,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fpvp(3,0,0,1) = (-bydvd(0,0,1)*zty(kv,jv,1)-bxdvd(0,0,1)*ztx(kv,jv
1,1))/rdj(kv,jv)
fpvp(3,0,0,2) = (-bydvd(0,0,2)*zty(kv,jv,1)-bxdvd(0,0,2)*ztx(kv,jv
1,1))/rdj(kv,jv)
fpvp(3,0,0,3) = (-bydvd(0,0,3)*zty(kv,jv,1)-bxdvd(0,0,3)*ztx(kv,jv
1,1))/rdj(kv,jv)
fpvp(3,0,1,0) = (-bydvd(0,1,0)*zty(kv,jv,1)-bxdvd(0,1,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fpvp(3,0,1,1) = (-bydvd(0,1,1)*zty(kv,jv,1)-bxdvd(0,1,1)*ztx(kv,jv
1,1))/rdj(kv,jv)
fpvp(3,0,1,2) = (-bydvd(0,1,2)*zty(kv,jv,1)-bxdvd(0,1,2)*ztx(kv,jv
1,1))/rdj(kv,jv)
fpvp(3,0,1,3) = 0
fpvp(3,0,2,0) = (-bydvd(0,2,0)*zty(kv,jv,1)-bxdvd(0,2,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fpvp(3,0,2,1) = (-bydvd(0,2,1)*zty(kv,jv,1)-bxdvd(0,2,1)*ztx(kv,jv
1,1))/rdj(kv,jv)
fpvp(3,0,2,2) = (-bydvd(0,2,2)*zty(kv,jv,1)-bxdvd(0,2,2)*ztx(kv,jv
1,1))/rdj(kv,jv)
fpvp(3,0,2,3) = 0
fpvp(3,0,3,0) = (-bydvd(0,3,0)*zty(kv,jv,1)-bxdvd(0,3,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fpvp(3,0,3,1) = 0
fpvp(3,0,3,2) = 0
fpvp(3,0,3,3) = 0
fpvp(3,1,0,0) = (-bydvd(1,0,0)*zty(kv,jv,1)-bxdvd(1,0,0)*ztx(kv,jv

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1      ,1))/rdj(kv,jv)
  fpvp(3,1,0,1) = (-bydvd(1,0,1)*zty(kv,jv,1)-bxdvd(1,0,1)*ztx(kv,jv
1      ,1))/rdj(kv,jv)
  fpvp(3,1,0,2) = (-bydvd(1,0,2)*zty(kv,jv,1)-bxdvd(1,0,2)*ztx(kv,jv
1      ,1))/rdj(kv,jv)
  fpvp(3,1,0,3) = 0
  fpvp(3,1,1,0) = (-bydvd(1,1,0)*zty(kv,jv,1)-bxdvd(1,1,0)*ztx(kv,jv
1      ,1))/rdj(kv,jv)
  fpvp(3,1,1,1) = 0
  fpvp(3,1,1,2) = 0
  fpvp(3,1,1,3) = 0
  fpvp(3,1,2,0) = (-bydvd(1,2,0)*zty(kv,jv,1)-bxdvd(1,2,0)*ztx(kv,jv
1      ,1))/rdj(kv,jv)
  fpvp(3,1,2,1) = 0
  fpvp(3,1,2,2) = 0
  fpvp(3,1,2,3) = 0
  fpvp(3,1,3,0) = 0
  fpvp(3,1,3,1) = 0
  fpvp(3,1,3,2) = 0
  fpvp(3,1,3,3) = 0
  fpvp(3,2,0,0) = (-bydvd(2,0,0)*zty(kv,jv,1)-bxdvd(2,0,0)*ztx(kv,jv
1      ,1))/rdj(kv,jv)
  fpvp(3,2,0,1) = (-bydvd(2,0,1)*zty(kv,jv,1)-bxdvd(2,0,1)*ztx(kv,jv
1      ,1))/rdj(kv,jv)
  fpvp(3,2,0,2) = (-bydvd(2,0,2)*zty(kv,jv,1)-bxdvd(2,0,2)*ztx(kv,jv
1      ,1))/rdj(kv,jv)
  fpvp(3,2,0,3) = 0
  fpvp(3,2,1,0) = (-bydvd(2,1,0)*zty(kv,jv,1)-bxdvd(2,1,0)*ztx(kv,jv
1      ,1))/rdj(kv,jv)
  fpvp(3,2,1,1) = 0
  fpvp(3,2,1,2) = 0
  fpvp(3,2,1,3) = 0
  fpvp(3,2,2,0) = (-bydvd(2,2,0)*zty(kv,jv,1)-bxdvd(2,2,0)*ztx(kv,jv
1      ,1))/rdj(kv,jv)
  fpvp(3,2,2,1) = 0
  fpvp(3,2,2,2) = 0
  fpvp(3,2,2,3) = 0
  fpvp(3,2,3,0) = 0
  fpvp(3,2,3,1) = 0
  fpvp(3,2,3,2) = 0
  fpvp(3,2,3,3) = 0
  fpvp(3,3,0,0) = (-bydvd(3,0,0)*zty(kv,jv,1)-bxdvd(3,0,0)*ztx(kv,jv
1      ,1))/rdj(kv,jv)
  fpvp(3,3,0,1) = 0
  fpvp(3,3,0,2) = 0
  fpvp(3,3,0,3) = 0
  fpvp(3,3,1,0) = 0
  fpvp(3,3,1,1) = 0
  fpvp(3,3,1,2) = 0
  fpvp(3,3,1,3) = 0
  fpvp(3,3,2,0) = 0
  fpvp(3,3,2,1) = 0
  fpvp(3,3,2,2) = 0
  fpvp(3,3,2,3) = 0
  fpvp(3,3,3,0) = 0
  fpvp(3,3,3,1) = 0
  fpvp(3,3,3,2) = 0
  fpvp(3,3,3,3) = 0
  fupp(0,0,0,0) = 0

```

```

fupp(0,0,0,1) = 0
fupp(0,0,0,2) = 0
fupp(0,0,0,3) = 0
fupp(0,0,1,0) = 0
fupp(0,0,1,1) = 0
fupp(0,0,1,2) = 0
fupp(0,0,1,3) = 0
fupp(0,0,2,0) = 0
fupp(0,0,2,1) = 0
fupp(0,0,2,2) = 0
fupp(0,0,2,3) = 0
fupp(0,0,3,0) = 0
fupp(0,0,3,1) = 0
fupp(0,0,3,2) = 0
fupp(0,0,3,3) = 0
fupp(0,1,0,0) = 0
fupp(0,1,0,1) = 0
fupp(0,1,0,2) = 0
fupp(0,1,0,3) = 0
fupp(0,1,1,0) = 0
fupp(0,1,1,1) = 0
fupp(0,1,1,2) = 0
fupp(0,1,1,3) = 0
fupp(0,1,2,0) = 0
fupp(0,1,2,1) = 0
fupp(0,1,2,2) = 0
fupp(0,1,2,3) = 0
fupp(0,1,3,0) = 0
fupp(0,1,3,1) = 0
fupp(0,1,3,2) = 0
fupp(0,1,3,3) = 0
fupp(0,2,0,0) = 0
fupp(0,2,0,1) = 0
fupp(0,2,0,2) = 0
fupp(0,2,0,3) = 0
fupp(0,2,1,0) = 0
fupp(0,2,1,1) = 0
fupp(0,2,1,2) = 0
fupp(0,2,1,3) = 0
fupp(0,2,2,0) = 0
fupp(0,2,2,1) = 0
fupp(0,2,2,2) = 0
fupp(0,2,2,3) = 0
fupp(0,2,3,0) = 0
fupp(0,2,3,1) = 0
fupp(0,2,3,2) = 0
fupp(0,2,3,3) = 0
fupp(0,3,0,0) = 0
fupp(0,3,0,1) = 0
fupp(0,3,0,2) = 0
fupp(0,3,0,3) = 0
fupp(0,3,1,0) = 0
fupp(0,3,1,1) = 0
fupp(0,3,1,2) = 0
fupp(0,3,1,3) = 0
fupp(0,3,2,0) = 0
fupp(0,3,2,1) = 0
fupp(0,3,2,2) = 0
fupp(0,3,2,3) = 0

```

```

fupp(0,0,0,1) = 0
fupp(0,0,0,2) = 0
fupp(0,0,0,3) = 0
fupp(0,0,1,0) = 0
fupp(0,0,1,1) = 0
fupp(0,0,1,2) = 0
fupp(0,0,1,3) = 0
fupp(0,0,2,0) = 0
fupp(0,0,2,1) = 0
fupp(0,0,2,2) = 0
fupp(0,0,2,3) = 0
fupp(0,0,3,0) = 0
fupp(0,0,3,1) = 0
fupp(0,0,3,2) = 0
fupp(0,0,3,3) = 0
fupp(0,1,0,0) = 0
fupp(0,1,0,1) = 0
fupp(0,1,0,2) = 0
fupp(0,1,0,3) = 0
fupp(0,1,1,0) = 0
fupp(0,1,1,1) = 0
fupp(0,1,1,2) = 0
fupp(0,1,1,3) = 0
fupp(0,1,2,0) = 0
fupp(0,1,2,1) = 0
fupp(0,1,2,2) = 0
fupp(0,1,2,3) = 0
fupp(0,1,3,0) = 0
fupp(0,1,3,1) = 0
fupp(0,1,3,2) = 0
fupp(0,1,3,3) = 0
fupp(0,2,0,0) = 0
fupp(0,2,0,1) = 0
fupp(0,2,0,2) = 0
fupp(0,2,0,3) = 0
fupp(0,2,1,0) = 0
fupp(0,2,1,1) = 0
fupp(0,2,1,2) = 0
fupp(0,2,1,3) = 0
fupp(0,2,2,0) = 0
fupp(0,2,2,1) = 0
fupp(0,2,2,2) = 0
fupp(0,2,2,3) = 0
fupp(0,2,3,0) = 0
fupp(0,2,3,1) = 0
fupp(0,2,3,2) = 0
fupp(0,2,3,3) = 0
fupp(0,3,0,0) = 0
fupp(0,3,0,1) = 0
fupp(0,3,0,2) = 0
fupp(0,3,0,3) = 0
fupp(0,3,1,0) = 0
fupp(0,3,1,1) = 0
fupp(0,3,1,2) = 0
fupp(0,3,1,3) = 0
fupp(0,3,2,0) = 0
fupp(0,3,2,1) = 0
fupp(0,3,2,2) = 0
fupp(0,3,2,3) = 0

```

```

fupp(0,3,3,0) = 0
fupp(0,3,3,1) = 0
fupp(0,3,3,2) = 0
fupp(0,3,3,3) = 0
fupp(1,0,0,0) = (-zty(kv,jv,1)*txyudd(0,0,0)-ztx(kv,jv,1)*txxudd(0
1  ,0,0))/rdj(kv,jv)
fupp(1,0,0,1) = (-zty(kv,jv,1)*txyudd(0,0,1)-ztx(kv,jv,1)*txxudd(0
1  ,0,1))/rdj(kv,jv)
fupp(1,0,0,2) = (-zty(kv,jv,1)*txyudd(0,0,2)-ztx(kv,jv,1)*txxudd(0
1  ,0,2))/rdj(kv,jv)
fupp(1,0,0,3) = 0
fupp(1,0,1,0) = (-zty(kv,jv,1)*txyudd(0,1,0)-ztx(kv,jv,1)*txxudd(0
1  ,1,0))/rdj(kv,jv)
fupp(1,0,1,1) = 0
fupp(1,0,1,2) = 0
fupp(1,0,1,3) = 0
fupp(1,0,2,0) = (-zty(kv,jv,1)*txyudd(0,2,0)-ztx(kv,jv,1)*txxudd(0
1  ,2,0))/rdj(kv,jv)
fupp(1,0,2,1) = 0
fupp(1,0,2,2) = 0
fupp(1,0,2,3) = 0
fupp(1,0,3,0) = 0
fupp(1,0,3,1) = 0
fupp(1,0,3,2) = 0
fupp(1,0,3,3) = 0
fupp(1,1,0,0) = (-zty(kv,jv,1)*txyudd(1,0,0)-ztx(kv,jv,1)*txxudd(1
1  ,0,0))/rdj(kv,jv)
fupp(1,1,0,1) = 0
fupp(1,1,0,2) = 0
fupp(1,1,0,3) = 0
fupp(1,1,1,0) = 0
fupp(1,1,1,1) = 0
fupp(1,1,1,2) = 0
fupp(1,1,1,3) = 0
fupp(1,1,2,0) = 0
fupp(1,1,2,1) = 0
fupp(1,1,2,2) = 0
fupp(1,1,2,3) = 0
fupp(1,1,3,0) = 0
fupp(1,1,3,1) = 0
fupp(1,1,3,2) = 0
fupp(1,1,3,3) = 0
fupp(1,2,0,0) = (-zty(kv,jv,1)*txyudd(2,0,0)-ztx(kv,jv,1)*txxudd(2
1  ,0,0))/rdj(kv,jv)
fupp(1,2,0,1) = 0
fupp(1,2,0,2) = 0
fupp(1,2,0,3) = 0
fupp(1,2,1,0) = 0
fupp(1,2,1,1) = 0
fupp(1,2,1,2) = 0
fupp(1,2,1,3) = 0
fupp(1,2,2,0) = 0
fupp(1,2,2,1) = 0
fupp(1,2,2,2) = 0
fupp(1,2,2,3) = 0
fupp(1,2,3,0) = 0
fupp(1,2,3,1) = 0
fupp(1,2,3,2) = 0
fupp(1,2,3,3) = 0

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fupp(1,3,0,0) = 0
fupp(1,3,0,1) = 0
fupp(1,3,0,2) = 0
fupp(1,3,0,3) = 0
fupp(1,3,1,0) = 0
fupp(1,3,1,1) = 0
fupp(1,3,1,2) = 0
fupp(1,3,1,3) = 0
fupp(1,3,2,0) = 0
fupp(1,3,2,1) = 0
fupp(1,3,2,2) = 0
fupp(1,3,2,3) = 0
fupp(1,3,3,0) = 0
fupp(1,3,3,1) = 0
fupp(1,3,3,2) = 0
fupp(1,3,3,3) = 0
fupp(2,0,0,0) = (-zty(kv,jv,1)*t yyudd(0,0,0)-ztx(kv,jv,1)*txyudd(0
1  ,0,0))/rdj(kv,jv)
fupp(2,0,0,1) = (-zty(kv,jv,1)*t yyudd(0,0,1)-ztx(kv,jv,1)*txyudd(0
1  ,0,1))/rdj(kv,jv)
fupp(2,0,0,2) = (-zty(kv,jv,1)*t yyudd(0,0,2)-ztx(kv,jv,1)*txyudd(0
1  ,0,2))/rdj(kv,jv)
fupp(2,0,0,3) = 0
fupp(2,0,1,0) = (-zty(kv,jv,1)*t yyudd(0,1,0)-ztx(kv,jv,1)*txyudd(0
1  ,1,0))/rdj(kv,jv)
fupp(2,0,1,1) = 0
fupp(2,0,1,2) = 0
fupp(2,0,1,3) = 0
fupp(2,0,2,0) = (-zty(kv,jv,1)*t yyudd(0,2,0)-ztx(kv,jv,1)*txyudd(0
1  ,2,0))/rdj(kv,jv)
fupp(2,0,2,1) = 0
fupp(2,0,2,2) = 0
fupp(2,0,2,3) = 0
fupp(2,0,3,0) = 0
fupp(2,0,3,1) = 0
fupp(2,0,3,2) = 0
fupp(2,0,3,3) = 0
fupp(2,1,0,0) = (-zty(kv,jv,1)*t yyudd(1,0,0)-ztx(kv,jv,1)*txyudd(1
1  ,0,0))/rdj(kv,jv)
fupp(2,1,0,1) = 0
fupp(2,1,0,2) = 0
fupp(2,1,0,3) = 0
fupp(2,1,1,0) = 0
fupp(2,1,1,1) = 0
fupp(2,1,1,2) = 0
fupp(2,1,1,3) = 0
fupp(2,1,2,0) = 0
fupp(2,1,2,1) = 0
fupp(2,1,2,2) = 0
fupp(2,1,2,3) = 0
fupp(2,1,3,0) = 0
fupp(2,1,3,1) = 0
fupp(2,1,3,2) = 0
fupp(2,1,3,3) = 0
fupp(2,2,0,0) = (-zty(kv,jv,1)*t yyudd(2,0,0)-ztx(kv,jv,1)*txyudd(2
1  ,0,0))/rdj(kv,jv)
fupp(2,2,0,1) = 0
fupp(2,2,0,2) = 0
fupp(2,2,0,3) = 0

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fupp(2,2,1,0) = 0
fupp(2,2,1,1) = 0
fupp(2,2,1,2) = 0
fupp(2,2,1,3) = 0
fupp(2,2,2,0) = 0
fupp(2,2,2,1) = 0
fupp(2,2,2,2) = 0
fupp(2,2,2,3) = 0
fupp(2,2,3,0) = 0
fupp(2,2,3,1) = 0
fupp(2,2,3,2) = 0
fupp(2,2,3,3) = 0
fupp(2,3,0,0) = 0
fupp(2,3,0,1) = 0
fupp(2,3,0,2) = 0
fupp(2,3,0,3) = 0
fupp(2,3,1,0) = 0
fupp(2,3,1,1) = 0
fupp(2,3,1,2) = 0
fupp(2,3,1,3) = 0
fupp(2,3,2,0) = 0
fupp(2,3,2,1) = 0
fupp(2,3,2,2) = 0
fupp(2,3,2,3) = 0
fupp(2,3,3,0) = 0
fupp(2,3,3,1) = 0
fupp(2,3,3,2) = 0
fupp(2,3,3,3) = 0
fupp(3,0,0,0) = (-byudd(0,0,0)*zty(kv,jv,1)-bxudd(0,0,0)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,0,0,1) = (-byudd(0,0,1)*zty(kv,jv,1)-bxudd(0,0,1)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,0,0,2) = (-byudd(0,0,2)*zty(kv,jv,1)-bxudd(0,0,2)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,0,0,3) = (-byudd(0,0,3)*zty(kv,jv,1)-bxudd(0,0,3)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,0,1,0) = (-byudd(0,1,0)*zty(kv,jv,1)-bxudd(0,1,0)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,0,1,1) = (-byudd(0,1,1)*zty(kv,jv,1)-bxudd(0,1,1)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,0,1,2) = (-byudd(0,1,2)*zty(kv,jv,1)-bxudd(0,1,2)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,0,1,3) = 0
fupp(3,0,2,0) = (-byudd(0,2,0)*zty(kv,jv,1)-bxudd(0,2,0)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,0,2,1) = (-byudd(0,2,1)*zty(kv,jv,1)-bxudd(0,2,1)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,0,2,2) = (-byudd(0,2,2)*zty(kv,jv,1)-bxudd(0,2,2)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,0,2,3) = 0
fupp(3,0,3,0) = (-byudd(0,3,0)*zty(kv,jv,1)-bxudd(0,3,0)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,0,3,1) = 0
fupp(3,0,3,2) = 0
fupp(3,0,3,3) = 0
fupp(3,1,0,0) = (-byudd(1,0,0)*zty(kv,jv,1)-bxudd(1,0,0)*ztx(kv,jv
1    ,1))/rdj(kv,jv)
fupp(3,1,0,1) = (-byudd(1,0,1)*zty(kv,jv,1)-bxudd(1,0,1)*ztx(kv,jv
1    ,1))/rdj(kv,jv)

```



```

fupp(3,1,0,2) = (-byudd(1,0,2)*zty(kv,jv,1)-bxudd(1,0,2)*ztx(kv,jv
1,1))/rdj(kv,jv)
fupp(3,1,0,3) = 0
fupp(3,1,1,0) = (-byudd(1,1,0)*zty(kv,jv,1)-bxudd(1,1,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fupp(3,1,1,1) = 0
fupp(3,1,1,2) = 0
fupp(3,1,1,3) = 0
fupp(3,1,2,0) = (-byudd(1,2,0)*zty(kv,jv,1)-bxudd(1,2,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fupp(3,1,2,1) = 0
fupp(3,1,2,2) = 0
fupp(3,1,2,3) = 0
fupp(3,1,3,0) = 0
fupp(3,1,3,1) = 0
fupp(3,1,3,2) = 0
fupp(3,1,3,3) = 0
fupp(3,2,0,0) = (-byudd(2,0,0)*zty(kv,jv,1)-bxudd(2,0,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fupp(3,2,0,1) = (-byudd(2,0,1)*zty(kv,jv,1)-bxudd(2,0,1)*ztx(kv,jv
1,1))/rdj(kv,jv)
fupp(3,2,0,2) = (-byudd(2,0,2)*zty(kv,jv,1)-bxudd(2,0,2)*ztx(kv,jv
1,1))/rdj(kv,jv)
fupp(3,2,0,3) = 0
fupp(3,2,1,0) = (-byudd(2,1,0)*zty(kv,jv,1)-bxudd(2,1,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fupp(3,2,1,1) = 0
fupp(3,2,1,2) = 0
fupp(3,2,1,3) = 0
fupp(3,2,2,0) = (-byudd(2,2,0)*zty(kv,jv,1)-bxudd(2,2,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fupp(3,2,2,1) = 0
fupp(3,2,2,2) = 0
fupp(3,2,2,3) = 0
fupp(3,2,3,0) = 0
fupp(3,2,3,1) = 0
fupp(3,2,3,2) = 0
fupp(3,2,3,3) = 0
fupp(3,3,0,0) = (-byudd(3,0,0)*zty(kv,jv,1)-bxudd(3,0,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fupp(3,3,0,1) = 0
fupp(3,3,0,2) = 0
fupp(3,3,0,3) = 0
fupp(3,3,1,0) = 0
fupp(3,3,1,1) = 0
fupp(3,3,1,2) = 0
fupp(3,3,1,3) = 0
fupp(3,3,2,0) = 0
fupp(3,3,2,1) = 0
fupp(3,3,2,2) = 0
fupp(3,3,2,3) = 0
fupp(3,3,3,0) = 0
fupp(3,3,3,1) = 0
fupp(3,3,3,2) = 0
fupp(3,3,3,3) = 0
fvpp(0,0,0,0) = 0
fvpp(0,0,0,1) = 0
fvpp(0,0,0,2) = 0
fvpp(0,0,0,3) = 0

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fvpp(0,0,1,0) = 0
 fvpp(0,0,1,1) = 0
 fvpp(0,0,1,2) = 0
 fvpp(0,0,1,3) = 0
 fvpp(0,0,2,0) = 0
 fvpp(0,0,2,1) = 0
 fvpp(0,0,2,2) = 0
 fvpp(0,0,2,3) = 0
 fvpp(0,0,3,0) = 0
 fvpp(0,0,3,1) = 0
 fvpp(0,0,3,2) = 0
 fvpp(0,0,3,3) = 0
 fvpp(0,1,0,0) = 0
 fvpp(0,1,0,1) = 0
 fvpp(0,1,0,2) = 0
 fvpp(0,1,0,3) = 0
 fvpp(0,1,1,0) = 0
 fvpp(0,1,1,1) = 0
 fvpp(0,1,1,2) = 0
 fvpp(0,1,1,3) = 0
 fvpp(0,1,2,0) = 0
 fvpp(0,1,2,1) = 0
 fvpp(0,1,2,2) = 0
 fvpp(0,1,2,3) = 0
 fvpp(0,1,3,0) = 0
 fvpp(0,1,3,1) = 0
 fvpp(0,1,3,2) = 0
 fvpp(0,1,3,3) = 0
 fvpp(0,2,0,0) = 0
 fvpp(0,2,0,1) = 0
 fvpp(0,2,0,2) = 0
 fvpp(0,2,0,3) = 0
 fvpp(0,2,1,0) = 0
 fvpp(0,2,1,1) = 0
 fvpp(0,2,1,2) = 0
 fvpp(0,2,1,3) = 0
 fvpp(0,2,2,0) = 0
 fvpp(0,2,2,1) = 0
 fvpp(0,2,2,2) = 0
 fvpp(0,2,2,3) = 0
 fvpp(0,2,3,0) = 0
 fvpp(0,2,3,1) = 0
 fvpp(0,2,3,2) = 0
 fvpp(0,2,3,3) = 0
 fvpp(0,3,0,0) = 0
 fvpp(0,3,0,1) = 0
 fvpp(0,3,0,2) = 0
 fvpp(0,3,0,3) = 0
 fvpp(0,3,1,0) = 0
 fvpp(0,3,1,1) = 0
 fvpp(0,3,1,2) = 0
 fvpp(0,3,1,3) = 0
 fvpp(0,3,2,0) = 0
 fvpp(0,3,2,1) = 0
 fvpp(0,3,2,2) = 0
 fvpp(0,3,2,3) = 0
 fvpp(0,3,3,0) = 0
 fvpp(0,3,3,1) = 0
 fvpp(0,3,3,2) = 0

```

fvpp(0,3,3,3) = 0
fvpp(1,0,0,0) = (-zty(kv,jv,1)*txyvdd(0,0,0)-ztx(kv,jv,1)*txxvdd(0
1  ,0,0))/rdj(kv,jv)
fvpp(1,0,0,1) = (-zty(kv,jv,1)*txyvdd(0,0,1)-ztx(kv,jv,1)*txxvdd(0
1  ,0,1))/rdj(kv,jv)
fvpp(1,0,0,2) = (-zty(kv,jv,1)*txyvdd(0,0,2)-ztx(kv,jv,1)*txxvdd(0
1  ,0,2))/rdj(kv,jv)
fvpp(1,0,0,3) = 0
fvpp(1,0,1,0) = (-zty(kv,jv,1)*txyvdd(0,1,0)-ztx(kv,jv,1)*txxvdd(0
1  ,1,0))/rdj(kv,jv)
fvpp(1,0,1,1) = 0
fvpp(1,0,1,2) = 0
fvpp(1,0,1,3) = 0
fvpp(1,0,2,0) = (-zty(kv,jv,1)*txyvdd(0,2,0)-ztx(kv,jv,1)*txxvdd(0
1  ,2,0))/rdj(kv,jv)
fvpp(1,0,2,1) = 0
fvpp(1,0,2,2) = 0
fvpp(1,0,2,3) = 0
fvpp(1,0,3,0) = 0
fvpp(1,0,3,1) = 0
fvpp(1,0,3,2) = 0
fvpp(1,0,3,3) = 0
fvpp(1,1,0,0) = (-zty(kv,jv,1)*txyvdd(1,0,0)-ztx(kv,jv,1)*txxvdd(1
1  ,0,0))/rdj(kv,jv)
fvpp(1,1,0,1) = 0
fvpp(1,1,0,2) = 0
fvpp(1,1,0,3) = 0
fvpp(1,1,1,0) = 0
fvpp(1,1,1,1) = 0
fvpp(1,1,1,2) = 0
fvpp(1,1,1,3) = 0
fvpp(1,1,2,0) = 0
fvpp(1,1,2,1) = 0
fvpp(1,1,2,2) = 0
fvpp(1,1,2,3) = 0
fvpp(1,1,3,0) = 0
fvpp(1,1,3,1) = 0
fvpp(1,1,3,2) = 0
fvpp(1,1,3,3) = 0
fvpp(1,2,0,0) = (-zty(kv,jv,1)*txyvdd(2,0,0)-ztx(kv,jv,1)*txxvdd(2
1  ,0,0))/rdj(kv,jv)
fvpp(1,2,0,1) = 0
fvpp(1,2,0,2) = 0
fvpp(1,2,0,3) = 0
fvpp(1,2,1,0) = 0
fvpp(1,2,1,1) = 0
fvpp(1,2,1,2) = 0
fvpp(1,2,1,3) = 0
fvpp(1,2,2,0) = 0
fvpp(1,2,2,1) = 0
fvpp(1,2,2,2) = 0
fvpp(1,2,2,3) = 0
fvpp(1,2,3,0) = 0
fvpp(1,2,3,1) = 0
fvpp(1,2,3,2) = 0
fvpp(1,2,3,3) = 0
fvpp(1,3,0,0) = 0
fvpp(1,3,0,1) = 0
fvpp(1,3,0,2) = 0

```

```

fvpp(1,3,0,3) = 0
fvpp(1,3,1,0) = 0
fvpp(1,3,1,1) = 0
fvpp(1,3,1,2) = 0
fvpp(1,3,1,3) = 0
fvpp(1,3,2,0) = 0
fvpp(1,3,2,1) = 0
fvpp(1,3,2,2) = 0
fvpp(1,3,2,3) = 0
fvpp(1,3,3,0) = 0
fvpp(1,3,3,1) = 0
fvpp(1,3,3,2) = 0
fvpp(1,3,3,3) = 0
fvpp(2,0,0,0) = (-zty(kv,jv,1)*tyyvdd(0,0,0)-ztx(kv,jv,1)*txyvdd(0
1  ,0,0))/rdj(kv,jv)
fvpp(2,0,0,1) = (-zty(kv,jv,1)*tyyvdd(0,0,1)-ztx(kv,jv,1)*txyvdd(0
1  ,0,1))/rdj(kv,jv)
fvpp(2,0,0,2) = (-zty(kv,jv,1)*tyyvdd(0,0,2)-ztx(kv,jv,1)*txyvdd(0
1  ,0,2))/rdj(kv,jv)
fvpp(2,0,0,3) = 0
fvpp(2,0,1,0) = (-zty(kv,jv,1)*tyyvdd(0,1,0)-ztx(kv,jv,1)*txyvdd(0
1  ,1,0))/rdj(kv,jv)
fvpp(2,0,1,1) = 0
fvpp(2,0,1,2) = 0
fvpp(2,0,1,3) = 0
fvpp(2,0,2,0) = (-zty(kv,jv,1)*tyyvdd(0,2,0)-ztx(kv,jv,1)*txyvdd(0
1  ,2,0))/rdj(kv,jv)
fvpp(2,0,2,1) = 0
fvpp(2,0,2,2) = 0
fvpp(2,0,2,3) = 0
fvpp(2,0,3,0) = 0
fvpp(2,0,3,1) = 0
fvpp(2,0,3,2) = 0
fvpp(2,0,3,3) = 0
fvpp(2,1,0,0) = (-zty(kv,jv,1)*tyyvdd(1,0,0)-ztx(kv,jv,1)*txyvdd(1
1  ,0,0))/rdj(kv,jv)
fvpp(2,1,0,1) = 0
fvpp(2,1,0,2) = 0
fvpp(2,1,0,3) = 0
fvpp(2,1,1,0) = 0
fvpp(2,1,1,1) = 0
fvpp(2,1,1,2) = 0
fvpp(2,1,1,3) = 0
fvpp(2,1,2,0) = 0
fvpp(2,1,2,1) = 0
fvpp(2,1,2,2) = 0
fvpp(2,1,2,3) = 0
fvpp(2,1,3,0) = 0
fvpp(2,1,3,1) = 0
fvpp(2,1,3,2) = 0
fvpp(2,1,3,3) = 0
fvpp(2,2,0,0) = (-zty(kv,jv,1)*tyyvdd(2,0,0)-ztx(kv,jv,1)*txyvdd(2
1  ,0,0))/rdj(kv,jv)
fvpp(2,2,0,1) = 0
fvpp(2,2,0,2) = 0
fvpp(2,2,0,3) = 0
fvpp(2,2,1,0) = 0
fvpp(2,2,1,1) = 0
fvpp(2,2,1,2) = 0

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```

fvpp(2,2,1,3) = 0
fvpp(2,2,2,0) = 0
fvpp(2,2,2,1) = 0
fvpp(2,2,2,2) = 0
fvpp(2,2,2,3) = 0
fvpp(2,2,3,0) = 0
fvpp(2,2,3,1) = 0
fvpp(2,2,3,2) = 0
fvpp(2,2,3,3) = 0
fvpp(2,3,0,0) = 0
fvpp(2,3,0,1) = 0
fvpp(2,3,0,2) = 0
fvpp(2,3,0,3) = 0
fvpp(2,3,1,0) = 0
fvpp(2,3,1,1) = 0
fvpp(2,3,1,2) = 0
fvpp(2,3,1,3) = 0
fvpp(2,3,2,0) = 0
fvpp(2,3,2,1) = 0
fvpp(2,3,2,2) = 0
fvpp(2,3,2,3) = 0
fvpp(2,3,3,0) = 0
fvpp(2,3,3,1) = 0
fvpp(2,3,3,2) = 0
fvpp(2,3,3,3) = 0
fvpp(3,0,0,0) = (-byvdd(0,0,0)*zty(kv,jv,1)-bxvdd(0,0,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,0,0,1) = (-byvdd(0,0,1)*zty(kv,jv,1)-bxvdd(0,0,1)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,0,0,2) = (-byvdd(0,0,2)*zty(kv,jv,1)-bxvdd(0,0,2)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,0,0,3) = (-byvdd(0,0,3)*zty(kv,jv,1)-bxvdd(0,0,3)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,0,1,0) = (-byvdd(0,1,0)*zty(kv,jv,1)-bxvdd(0,1,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,0,1,1) = (-byvdd(0,1,1)*zty(kv,jv,1)-bxvdd(0,1,1)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,0,1,2) = (-byvdd(0,1,2)*zty(kv,jv,1)-bxvdd(0,1,2)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,0,1,3) = 0
fvpp(3,0,2,0) = (-byvdd(0,2,0)*zty(kv,jv,1)-bxvdd(0,2,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,0,2,1) = (-byvdd(0,2,1)*zty(kv,jv,1)-bxvdd(0,2,1)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,0,2,2) = (-byvdd(0,2,2)*zty(kv,jv,1)-bxvdd(0,2,2)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,0,2,3) = 0
fvpp(3,0,3,0) = (-byvdd(0,3,0)*zty(kv,jv,1)-bxvdd(0,3,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,0,3,1) = 0
fvpp(3,0,3,2) = 0
fvpp(3,0,3,3) = 0
fvpp(3,1,0,0) = (-byvdd(1,0,0)*zty(kv,jv,1)-bxvdd(1,0,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,1,0,1) = (-byvdd(1,0,1)*zty(kv,jv,1)-bxvdd(1,0,1)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,1,0,2) = (-byvdd(1,0,2)*zty(kv,jv,1)-bxvdd(1,0,2)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,1,0,3) = 0

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fvpp(3,1,1,0) = (-byvdd(1,1,0)*zty(kv,jv,1)-bxvdd(1,1,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,1,1,1) = 0
fvpp(3,1,1,2) = 0
fvpp(3,1,1,3) = 0
fvpp(3,1,2,0) = (-byvdd(1,2,0)*zty(kv,jv,1)-bxvdd(1,2,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,1,2,1) = 0
fvpp(3,1,2,2) = 0
fvpp(3,1,2,3) = 0
fvpp(3,1,3,0) = 0
fvpp(3,1,3,1) = 0
fvpp(3,1,3,2) = 0
fvpp(3,1,3,3) = 0
fvpp(3,2,0,0) = (-byvdd(2,0,0)*zty(kv,jv,1)-bxvdd(2,0,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,2,0,1) = (-byvdd(2,0,1)*zty(kv,jv,1)-bxvdd(2,0,1)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,2,0,2) = (-byvdd(2,0,2)*zty(kv,jv,1)-bxvdd(2,0,2)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,2,0,3) = 0
fvpp(3,2,1,0) = (-byvdd(2,1,0)*zty(kv,jv,1)-bxvdd(2,1,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,2,1,1) = 0
fvpp(3,2,1,2) = 0
fvpp(3,2,1,3) = 0
fvpp(3,2,2,0) = (-byvdd(2,2,0)*zty(kv,jv,1)-bxvdd(2,2,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,2,2,1) = 0
fvpp(3,2,2,2) = 0
fvpp(3,2,2,3) = 0
fvpp(3,2,3,0) = 0
fvpp(3,2,3,1) = 0
fvpp(3,2,3,2) = 0
fvpp(3,2,3,3) = 0
fvpp(3,3,0,0) = (-byvdd(3,0,0)*zty(kv,jv,1)-bxvdd(3,0,0)*ztx(kv,jv
1,1))/rdj(kv,jv)
fvpp(3,3,0,1) = 0
fvpp(3,3,0,2) = 0
fvpp(3,3,0,3) = 0
fvpp(3,3,1,0) = 0
fvpp(3,3,1,1) = 0
fvpp(3,3,1,2) = 0
fvpp(3,3,1,3) = 0
fvpp(3,3,2,0) = 0
fvpp(3,3,2,1) = 0
fvpp(3,3,2,2) = 0
fvpp(3,3,2,3) = 0
fvpp(3,3,3,0) = 0
fvpp(3,3,3,1) = 0
fvpp(3,3,3,2) = 0
fvpp(3,3,3,3) = 0

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gppp(0,0,0,0) = 3*cavdd00/rdj(kv,jv)
gppp(0,0,0,1) = 2*cavdd01/rdj(kv,jv)
gppp(0,0,0,2) = 2*cavdd02/rdj(kv,jv)
gppp(0,0,0,3) = 0
gppp(0,0,1,0) = cavdd10/rdj(kv,jv)+cavdd01/rdj(kv,jv)
gppp(0,0,1,1) = 0
gppp(0,0,1,2) = 0
gppp(0,0,1,3) = 0
gppp(0,0,2,0) = cavdd20/rdj(kv,jv)+cavdd02/rdj(kv,jv)
gppp(0,0,2,1) = 0
gppp(0,0,2,2) = 0
gppp(0,0,2,3) = 0
gppp(0,1,0,0) = 2*cavdd10/rdj(kv,jv)
gppp(0,1,0,1) = 0
gppp(0,1,0,2) = 0
gppp(0,1,0,3) = 0
gppp(0,2,0,0) = 2*cavdd20/rdj(kv,jv)
gppp(0,2,0,1) = 0
gppp(0,2,0,2) = 0
gppp(0,2,0,3) = 0
gppp(1,0,0,0) = (etx(kv,jv,1)*(pddd(0,0,0)-txxddd(0,0,0))-ety(kv,j
1 v,1)*txyddd(0,0,0))/rdj(kv,jv)
gppp(1,0,0,1) = (-ety(kv,jv,1)*txyddd(0,0,1)+etx(kv,jv,1)*(pddd(0,
1 0,1)-txxddd(0,0,1))+cavdd00)/rdj(kv,jv)
gppp(1,0,0,2) = (etx(kv,jv,1)*(pddd(0,0,2)-txxddd(0,0,2))-ety(kv,j
1 v,1)*txyddd(0,0,2))/rdj(kv,jv)
gppp(1,0,0,3) = 0
gppp(1,0,1,0) = (-ety(kv,jv,1)*txyddd(0,1,0)+etx(kv,jv,1)*(pddd(0,
1 1,0)-txxddd(0,1,0))+cavdd00)/rdj(kv,jv)
gppp(1,0,1,1) = (etx(kv,jv,1)*pddd(0,1,1)+2*cavdd01)/rdj(kv,jv)
gppp(1,0,1,2) = cavdd02/rdj(kv,jv)
gppp(1,0,1,3) = 0
gppp(1,0,2,0) = (etx(kv,jv,1)*(pddd(0,2,0)-txxddd(0,2,0))-ety(kv,j
1 v,1)*txyddd(0,2,0))/rdj(kv,jv)
gppp(1,0,2,1) = cavdd02/rdj(kv,jv)
gppp(1,0,2,2) = etx(kv,jv,1)*pddd(0,2,2)/rdj(kv,jv)
gppp(1,0,2,3) = 0
gppp(1,1,0,0) = (-ety(kv,jv,1)*txyddd(1,0,0)+etx(kv,jv,1)*(pddd(1,
1 0,0)-txxddd(1,0,0))+cavdd00)/rdj(kv,jv)
gppp(1,1,0,1) = (etx(kv,jv,1)*pddd(1,0,1)+cavdd10+cavdd01)/rdj(kv,
1 jv)
gppp(1,1,0,2) = cavdd02/rdj(kv,jv)
gppp(1,1,0,3) = 0
gppp(1,1,1,0) = (etx(kv,jv,1)*pddd(1,1,0)+2*cavdd10)/rdj(kv,jv)
gppp(1,1,1,1) = 0
gppp(1,1,1,2) = 0
gppp(1,1,1,3) = 0
gppp(1,1,2,0) = cavdd20/rdj(kv,jv)
gppp(1,1,2,1) = 0
gppp(1,1,2,2) = 0
gppp(1,1,2,3) = 0
gppp(1,2,0,0) = (etx(kv,jv,1)*(pddd(2,0,0)-txxddd(2,0,0))-ety(kv,j
1 v,1)*txyddd(2,0,0))/rdj(kv,jv)
gppp(1,2,0,1) = cavdd20/rdj(kv,jv)
gppp(1,2,0,2) = etx(kv,jv,1)*pddd(2,0,2)/rdj(kv,jv)
gppp(1,2,0,3) = 0
gppp(1,2,1,0) = cavdd20/rdj(kv,jv)

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gppp(1,2,1,1) = 0
gppp(1,2,1,2) = 0
gppp(1,2,1,3) = 0
gppp(1,2,2,0) = etx(kv,jv,1)*pddd(2,2,0)/rdj(kv,jv)
gppp(1,2,2,1) = 0
gppp(1,2,2,2) = 0
gppp(1,2,2,3) = 0
gppp(2,0,0,0) = (ety(kv,jv,1)*(pddd(0,0,0)-tyydd(0,0,0))-etx(kv,j
1 v,1)*txydd(0,0,0))/rdj(kv,jv)
gppp(2,0,0,1) = (ety(kv,jv,1)*(pddd(0,0,1)-tyydd(0,0,1))-etx(kv,j
1 v,1)*txydd(0,0,1))/rdj(kv,jv)
gppp(2,0,0,2) = (ety(kv,jv,1)*(pddd(0,0,2)-tyydd(0,0,2))-etx(kv,j
1 v,1)*txydd(0,0,2)+cavdd00)/rdj(kv,jv)
gppp(2,0,0,3) = 0
gppp(2,0,1,0) = (ety(kv,jv,1)*(pddd(0,1,0)-tyydd(0,1,0))-etx(kv,j
1 v,1)*txydd(0,1,0))/rdj(kv,jv)
gppp(2,0,1,1) = ety(kv,jv,1)*pddd(0,1,1)/rdj(kv,jv)
gppp(2,0,1,2) = cavdd01/rdj(kv,jv)
gppp(2,0,1,3) = 0
gppp(2,0,2,0) = (ety(kv,jv,1)*(pddd(0,2,0)-tyydd(0,2,0))-etx(kv,j
1 v,1)*txydd(0,2,0)+cavdd00)/rdj(kv,jv)
gppp(2,0,2,1) = cavdd01/rdj(kv,jv)
gppp(2,0,2,2) = (ety(kv,jv,1)*pddd(0,2,2)+2*cavdd02)/rdj(kv,jv)
gppp(2,0,2,3) = 0
gppp(2,1,0,0) = (ety(kv,jv,1)*(pddd(1,0,0)-tyydd(1,0,0))-etx(kv,j
1 v,1)*txydd(1,0,0))/rdj(kv,jv)
gppp(2,1,0,1) = ety(kv,jv,1)*pddd(1,0,1)/rdj(kv,jv)
gppp(2,1,0,2) = cavdd10/rdj(kv,jv)
gppp(2,1,0,3) = 0
gppp(2,1,1,0) = ety(kv,jv,1)*pddd(1,1,0)/rdj(kv,jv)
gppp(2,1,1,1) = 0
gppp(2,1,1,2) = 0
gppp(2,1,1,3) = 0
gppp(2,1,2,0) = cavdd10/rdj(kv,jv)
gppp(2,1,2,1) = 0
gppp(2,1,2,2) = 0
gppp(2,1,2,3) = 0
gppp(2,2,0,0) = (ety(kv,jv,1)*(pddd(2,0,0)-tyydd(2,0,0))-etx(kv,j
1 v,1)*txydd(2,0,0)+cavdd00)/rdj(kv,jv)
gppp(2,2,0,1) = cavdd01/rdj(kv,jv)
gppp(2,2,0,2) = (ety(kv,jv,1)*pddd(2,0,2)+cavdd20+cavdd02)/rdj(kv,
1 jv)
gppp(2,2,0,3) = 0
gppp(2,2,1,0) = cavdd10/rdj(kv,jv)
gppp(2,2,1,1) = 0
gppp(2,2,1,2) = 0
gppp(2,2,1,3) = 0
gppp(2,2,2,0) = (ety(kv,jv,1)*pddd(2,2,0)+2*cavdd20)/rdj(kv,jv)
gppp(2,2,2,1) = 0
gppp(2,2,2,2) = 0
gppp(2,2,2,3) = 0
gppp(3,0,0,0) = (cav*pddd(0,0,0)+3*cavd0*pdd00+3*cavdd00*pd0-byddd
1 (0,0,0)*ety(kv,jv,1)-bxddd(0,0,0)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,0,0,1) = (cav*pddd(0,0,1)+2*cavd0*pdd01+cavd1*pdd00+cavdd00
1 *pd1+2*cavdd01*pd0-byddd(0,0,1)*ety(kv,jv,1)-bxddd(0,0,1)*etx(k
2 v,jv,1))/rdj(kv,jv)
gppp(3,0,0,2) = (cav*pddd(0,0,2)+2*cavd0*pdd02+cavd2*pdd00+cavdd00
1 *pd2+2*cavdd02*pd0-byddd(0,0,2)*ety(kv,jv,1)-bxddd(0,0,2)*etx(k
2 v,jv,1))/rdj(kv,jv)

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gppp(3,0,0,3) = (cavdd00*(pd3+1)-byddd(0,0,3)*ety(kv,jv,1)-bxddd(0
1  ,0,3)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,0,1,0) = (cav*pddd(0,1,0)+cavd0*pdd10+cavd0*pdd01+cavd1*pdd
1  00+cavdd00*pd1+cavdd10*pd0+cavdd01*pd0-byddd(0,1,0)*ety(kv,jv,1
2  )-bxddd(0,1,0)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,0,1,1) = (cav*pddd(0,1,1)+cavd0*pdd11+2*cavd1*pdd01+2*cavdd
1  01*pd1-byddd(0,1,1)*ety(kv,jv,1)-bxddd(0,1,1)*etx(kv,jv,1))/rdj
2  (kv,jv)
gppp(3,0,1,2) = (cavd1*pdd02+cavd2*pdd01+cavdd01*pd2+cavdd02*pd1-b
1  yddd(0,1,2)*ety(kv,jv,1)-bxddd(0,1,2)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,0,1,3) = cavdd01*(pd3+1)/rdj(kv,jv)
gppp(3,0,2,0) = (cav*pddd(0,2,0)+cavd0*pdd20+cavd0*pdd02+cavd2*pdd
1  00+cavdd00*pd2+cavdd20*pd0+cavdd02*pd0-byddd(0,2,0)*ety(kv,jv,1
2  )-bxddd(0,2,0)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,0,2,1) = (cavd1*pdd02+cavd2*pdd01+cavdd01*pd2+cavdd02*pd1-b
1  yddd(0,2,1)*ety(kv,jv,1)-bxddd(0,2,1)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,0,2,2) = (cav*pddd(0,2,2)+cavd0*pdd22+2*cavd2*pdd02+2*cavdd
1  02*pd2-byddd(0,2,2)*ety(kv,jv,1)-bxddd(0,2,2)*etx(kv,jv,1))/rdj
2  (kv,jv)
gppp(3,0,2,3) = cavdd02*(pd3+1)/rdj(kv,jv)
gppp(3,0,3,0) = (cavdd00*(pd3+1)-byddd(0,3,0)*ety(kv,jv,1)-bxddd(0
1  ,3,0)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,0,3,1) = cavdd01*(pd3+1)/rdj(kv,jv)
gppp(3,0,3,2) = cavdd02*(pd3+1)/rdj(kv,jv)
gppp(3,0,3,3) = 0
gppp(3,1,0,0) = (cav*pddd(1,0,0)+2*cavd0*pdd10+cavd1*pdd00+cavdd00
1  *pd1+2*cavdd10*pd0-byddd(1,0,0)*ety(kv,jv,1)-bxddd(1,0,0)*etx(k
2  v,jv,1))/rdj(kv,jv)
gppp(3,1,0,1) = (cav*pddd(1,0,1)+cavd0*pdd11+cavd1*pdd10+cavd1*pdd
1  01+cavdd10*pd1+cavdd01*pd1-byddd(1,0,1)*ety(kv,jv,1)-bxddd(1,0,
2  1)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,1,0,2) = (cavd2*pdd10+cavd1*pdd02+cavdd10*pd2+cavdd02*pd1-b
1  yddd(1,0,2)*ety(kv,jv,1)-bxddd(1,0,2)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,1,0,3) = cavdd10*(pd3+1)/rdj(kv,jv)
gppp(3,1,1,0) = (cav*pddd(1,1,0)+cavd0*pdd11+2*cavd1*pdd10+2*cavdd
1  10*pd1-byddd(1,1,0)*ety(kv,jv,1)-bxddd(1,1,0)*etx(kv,jv,1))/rdj
2  (kv,jv)
gppp(3,1,1,1) = 3*cavd1*pdd11/rdj(kv,jv)
gppp(3,1,1,2) = cavd2*pdd11/rdj(kv,jv)
gppp(3,1,1,3) = 0
gppp(3,1,2,0) = (cavd1*pdd20+cavd2*pdd10+cavdd10*pd2+cavdd20*pd1-b
1  yddd(1,2,0)*ety(kv,jv,1)-bxddd(1,2,0)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,1,2,1) = cavd2*pdd11/rdj(kv,jv)
gppp(3,1,2,2) = cavd1*pdd22/rdj(kv,jv)
gppp(3,1,2,3) = 0
gppp(3,1,3,0) = cavdd10*(pd3+1)/rdj(kv,jv)
gppp(3,1,3,1) = 0
gppp(3,1,3,2) = 0
gppp(3,1,3,3) = 0
gppp(3,2,0,0) = (cav*pddd(2,0,0)+2*cavd0*pdd20+cavd2*pdd00+cavdd00
1  *pd2+2*cavdd20*pd0-byddd(2,0,0)*ety(kv,jv,1)-bxddd(2,0,0)*etx(k
2  v,jv,1))/rdj(kv,jv)
gppp(3,2,0,1) = (cavd1*pdd20+cavd2*pdd01+cavdd01*pd2+cavdd20*pd1-b
1  yddd(2,0,1)*ety(kv,jv,1)-bxddd(2,0,1)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,2,0,2) = (cav*pddd(2,0,2)+cavd0*pdd22+cavd2*pdd20+cavd2*pdd
1  02+cavdd20*pd2+cavdd02*pd2-byddd(2,0,2)*ety(kv,jv,1)-bxddd(2,0,
2  2)*etx(kv,jv,1))/rdj(kv,jv)
gppp(3,2,0,3) = cavdd20*(pd3+1)/rdj(kv,jv)
gppp(3,2,1,0) = (cavd1*pdd20+cavd2*pdd10+cavdd10*pd2+cavdd20*pd1-b

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1  yddd(2,1,0)*ety(kv,jv,1)-bxddd(2,1,0)*etx(kv,jv,1))/rdj(kv,jv)
  gppp(3,2,1,1) = cavd2*pdd11/rdj(kv,jv)
  gppp(3,2,1,2) = cavd1*pdd22/rdj(kv,jv)
  gppp(3,2,1,3) = 0
  gppp(3,2,2,0) = (cav*pddd(2,2,0)+cavd0*pdd22+2*cavd2*pdd20+2*cavdd
1  20*pd2-byddd(2,2,0)*ety(kv,jv,1)-bxddd(2,2,0)*etx(kv,jv,1))/rdj
2  (kv,jv)
  gppp(3,2,2,1) = cavd1*pdd22/rdj(kv,jv)
  gppp(3,2,2,2) = 3*cavd2*pdd22/rdj(kv,jv)
  gppp(3,2,2,3) = 0
  gppp(3,2,3,0) = cavdd20*(pd3+1)/rdj(kv,jv)
  gppp(3,2,3,1) = 0
  gppp(3,2,3,2) = 0
  gppp(3,2,3,3) = 0
  gppp(3,3,0,0) = (cavdd00*(pd3+1)-byddd(3,0,0)*ety(kv,jv,1)-bxddd(3
1  ,0,0)*etx(kv,jv,1))/rdj(kv,jv)
  gppp(3,3,0,1) = cavdd01*(pd3+1)/rdj(kv,jv)
  gppp(3,3,0,2) = cavdd02*(pd3+1)/rdj(kv,jv)
  gppp(3,3,0,3) = 0
  gppp(3,3,1,0) = cavdd10*(pd3+1)/rdj(kv,jv)
  gppp(3,3,1,1) = 0
  gppp(3,3,1,2) = 0
  gppp(3,3,1,3) = 0
  gppp(3,3,2,0) = cavdd20*(pd3+1)/rdj(kv,jv)
  gppp(3,3,2,1) = 0
  gppp(3,3,2,2) = 0
  gppp(3,3,2,3) = 0
  gppu(0,0,0,0) = 0
  gppu(0,0,0,1) = 0
  gppu(0,0,0,2) = 0
  gppu(0,0,0,3) = 0
  gppu(0,0,1,0) = 0
  gppu(0,0,1,1) = 0
  gppu(0,0,1,2) = 0
  gppu(0,0,1,3) = 0
  gppu(0,0,2,0) = 0
  gppu(0,0,2,1) = 0
  gppu(0,0,2,2) = 0
  gppu(0,0,2,3) = 0
  gppu(0,1,0,0) = 0
  gppu(0,1,0,1) = 0
  gppu(0,1,0,2) = 0
  gppu(0,1,0,3) = 0
  gppu(0,2,0,0) = 0
  gppu(0,2,0,1) = 0
  gppu(0,2,0,2) = 0
  gppu(0,2,0,3) = 0
  gppu(1,0,0,0) = (-ety(kv,jv,1)*txyddu(0,0,0)-etx(kv,jv,1)*txxddu(0
1  ,0,0))/rdj(kv,jv)
  gppu(1,0,0,1) = (-ety(kv,jv,1)*txyddu(0,0,1)-etx(kv,jv,1)*txxddu(0
1  ,0,1))/rdj(kv,jv)
  gppu(1,0,0,2) = (-ety(kv,jv,1)*txyddu(0,0,2)-etx(kv,jv,1)*txxddu(0
1  ,0,2))/rdj(kv,jv)
  gppu(1,0,0,3) = 0
  gppu(1,0,1,0) = (-ety(kv,jv,1)*txyddu(0,1,0)-etx(kv,jv,1)*txxddu(0
1  ,1,0))/rdj(kv,jv)
  gppu(1,0,1,1) = 0
  gppu(1,0,1,2) = 0
  gppu(1,0,1,3) = 0

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gppu(1,0,2,0) = (-ety(kv,jv,1)*txyddu(0,2,0)-etx(kv,jv,1)*txxddu(0
1  ,2,0))/rdj(kv,jv)
gppu(1,0,2,1) = 0
gppu(1,0,2,2) = 0
gppu(1,0,2,3) = 0
gppu(1,1,0,0) = (-ety(kv,jv,1)*txyddu(1,0,0)-etx(kv,jv,1)*txxddu(1
1  ,0,0))/rdj(kv,jv)
gppu(1,1,0,1) = 0
gppu(1,1,0,2) = 0
gppu(1,1,0,3) = 0
gppu(1,1,1,0) = 0
gppu(1,1,1,1) = 0
gppu(1,1,1,2) = 0
gppu(1,1,1,3) = 0
gppu(1,1,2,0) = 0
gppu(1,1,2,1) = 0
gppu(1,1,2,2) = 0
gppu(1,1,2,3) = 0
gppu(1,2,0,0) = (-ety(kv,jv,1)*txyddu(2,0,0)-etx(kv,jv,1)*txxddu(2
1  ,0,0))/rdj(kv,jv)
gppu(1,2,0,1) = 0
gppu(1,2,0,2) = 0
gppu(1,2,0,3) = 0
gppu(1,2,1,0) = 0
gppu(1,2,1,1) = 0
gppu(1,2,1,2) = 0
gppu(1,2,1,3) = 0
gppu(1,2,2,0) = 0
gppu(1,2,2,1) = 0
gppu(1,2,2,2) = 0
gppu(1,2,2,3) = 0
gppu(2,0,0,0) = (-ety(kv,jv,1)*tyyddu(0,0,0)-etx(kv,jv,1)*txyddu(0
1  ,0,0))/rdj(kv,jv)
gppu(2,0,0,1) = (-ety(kv,jv,1)*tyyddu(0,0,1)-etx(kv,jv,1)*txyddu(0
1  ,0,1))/rdj(kv,jv)
gppu(2,0,0,2) = (-ety(kv,jv,1)*tyyddu(0,0,2)-etx(kv,jv,1)*txyddu(0
1  ,0,2))/rdj(kv,jv)
gppu(2,0,0,3) = 0
gppu(2,0,1,0) = (-ety(kv,jv,1)*tyyddu(0,1,0)-etx(kv,jv,1)*txyddu(0
1  ,1,0))/rdj(kv,jv)
gppu(2,0,1,1) = 0
gppu(2,0,1,2) = 0
gppu(2,0,1,3) = 0
gppu(2,0,2,0) = (-ety(kv,jv,1)*tyyddu(0,2,0)-etx(kv,jv,1)*txyddu(0
1  ,2,0))/rdj(kv,jv)
gppu(2,0,2,1) = 0
gppu(2,0,2,2) = 0
gppu(2,0,2,3) = 0
gppu(2,1,0,0) = (-ety(kv,jv,1)*tyyddu(1,0,0)-etx(kv,jv,1)*txyddu(1
1  ,0,0))/rdj(kv,jv)
gppu(2,1,0,1) = 0
gppu(2,1,0,2) = 0
gppu(2,1,0,3) = 0
gppu(2,1,1,0) = 0
gppu(2,1,1,1) = 0
gppu(2,1,1,2) = 0
gppu(2,1,1,3) = 0
gppu(2,1,2,0) = 0
gppu(2,1,2,1) = 0

```

```

gppu(2,1,2,2) = 0
gppu(2,1,2,3) = 0
gppu(2,2,0,0) = (-ety(kv,jv,1)*tyyddu(2,0,0)-etx(kv,jv,1)*txyddu(2
1  ,0,0))/rdj(kv,jv)
gppu(2,2,0,1) = 0
gppu(2,2,0,2) = 0
gppu(2,2,0,3) = 0
gppu(2,2,1,0) = 0
gppu(2,2,1,1) = 0
gppu(2,2,1,2) = 0
gppu(2,2,1,3) = 0
gppu(2,2,2,0) = 0
gppu(2,2,2,1) = 0
gppu(2,2,2,2) = 0
gppu(2,2,2,3) = 0
gppu(3,0,0,0) = (-byddu(0,0,0)*ety(kv,jv,1)-bxddu(0,0,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,0,0,1) = (-byddu(0,0,1)*ety(kv,jv,1)-bxddu(0,0,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,0,0,2) = (-byddu(0,0,2)*ety(kv,jv,1)-bxddu(0,0,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,0,0,3) = (-byddu(0,0,3)*ety(kv,jv,1)-bxddu(0,0,3)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,0,1,0) = (-byddu(0,1,0)*ety(kv,jv,1)-bxddu(0,1,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,0,1,1) = (-byddu(0,1,1)*ety(kv,jv,1)-bxddu(0,1,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,0,1,2) = (-byddu(0,1,2)*ety(kv,jv,1)-bxddu(0,1,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,0,1,3) = 0
gppu(3,0,2,0) = (-byddu(0,2,0)*ety(kv,jv,1)-bxddu(0,2,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,0,2,1) = (-byddu(0,2,1)*ety(kv,jv,1)-bxddu(0,2,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,0,2,2) = (-byddu(0,2,2)*ety(kv,jv,1)-bxddu(0,2,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,0,2,3) = 0
gppu(3,0,3,0) = (-byddu(0,3,0)*ety(kv,jv,1)-bxddu(0,3,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,0,3,1) = 0
gppu(3,0,3,2) = 0
gppu(3,0,3,3) = 0
gppu(3,1,0,0) = (-byddu(1,0,0)*ety(kv,jv,1)-bxddu(1,0,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,1,0,1) = (-byddu(1,0,1)*ety(kv,jv,1)-bxddu(1,0,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,1,0,2) = (-byddu(1,0,2)*ety(kv,jv,1)-bxddu(1,0,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,1,0,3) = 0
gppu(3,1,1,0) = (-byddu(1,1,0)*ety(kv,jv,1)-bxddu(1,1,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,1,1,1) = 0
gppu(3,1,1,2) = 0
gppu(3,1,1,3) = 0
gppu(3,1,2,0) = (-byddu(1,2,0)*ety(kv,jv,1)-bxddu(1,2,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppu(3,1,2,1) = 0
gppu(3,1,2,2) = 0
gppu(3,1,2,3) = 0

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gppu(3,1,3,0) = 0
gppu(3,1,3,1) = 0
gppu(3,1,3,2) = 0
gppu(3,1,3,3) = 0
gppu(3,2,0,0) = (-byddu(2,0,0)*ety(kv,jv,1)-bxddu(2,0,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gppu(3,2,0,1) = (-byddu(2,0,1)*ety(kv,jv,1)-bxddu(2,0,1)*etx(kv,jv
1,1))/rdj(kv,jv)
gppu(3,2,0,2) = (-byddu(2,0,2)*ety(kv,jv,1)-bxddu(2,0,2)*etx(kv,jv
1,1))/rdj(kv,jv)
gppu(3,2,0,3) = 0
gppu(3,2,1,0) = (-byddu(2,1,0)*ety(kv,jv,1)-bxddu(2,1,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gppu(3,2,1,1) = 0
gppu(3,2,1,2) = 0
gppu(3,2,1,3) = 0
gppu(3,2,2,0) = (-byddu(2,2,0)*ety(kv,jv,1)-bxddu(2,2,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gppu(3,2,2,1) = 0
gppu(3,2,2,2) = 0
gppu(3,2,2,3) = 0
gppu(3,2,3,0) = 0
gppu(3,2,3,1) = 0
gppu(3,2,3,2) = 0
gppu(3,2,3,3) = 0
gppu(3,3,0,0) = (-byddu(3,0,0)*ety(kv,jv,1)-bxddu(3,0,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gppu(3,3,0,1) = 0
gppu(3,3,0,2) = 0
gppu(3,3,0,3) = 0
gppu(3,3,1,0) = 0
gppu(3,3,1,1) = 0
gppu(3,3,1,2) = 0
gppu(3,3,1,3) = 0
gppu(3,3,2,0) = 0
gppu(3,3,2,1) = 0
gppu(3,3,2,2) = 0
gppu(3,3,2,3) = 0
gppv(0,0,0,0) = 0
gppv(0,0,0,1) = 0
gppv(0,0,0,2) = 0
gppv(0,0,0,3) = 0
gppv(0,0,1,0) = 0
gppv(0,0,1,1) = 0
gppv(0,0,1,2) = 0
gppv(0,0,1,3) = 0
gppv(0,0,2,0) = 0
gppv(0,0,2,1) = 0
gppv(0,0,2,2) = 0
gppv(0,0,2,3) = 0
gppv(0,1,0,0) = 0
gppv(0,1,0,1) = 0
gppv(0,1,0,2) = 0
gppv(0,1,0,3) = 0
gppv(0,2,0,0) = 0
gppv(0,2,0,1) = 0
gppv(0,2,0,2) = 0
gppv(0,2,0,3) = 0
gppv(1,0,0,0) = (-ety(kv,jv,1)*txyddv(0,0,0)-etx(kv,jv,1)*txxddv(0

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1      ,0,0))/rdj(kv,jv)
  gppv(1,0,0,1) = (-ety(kv,jv,1)*txyddv(0,0,1)-etx(kv,jv,1)*txxddv(0
1      ,0,1))/rdj(kv,jv)
  gppv(1,0,0,2) = (-ety(kv,jv,1)*txyddv(0,0,2)-etx(kv,jv,1)*txxddv(0
1      ,0,2))/rdj(kv,jv)
  gppv(1,0,0,3) = 0
  gppv(1,0,1,0) = (-ety(kv,jv,1)*txyddv(0,1,0)-etx(kv,jv,1)*txxddv(0
1      ,1,0))/rdj(kv,jv)
  gppv(1,0,1,1) = 0
  gppv(1,0,1,2) = 0
  gppv(1,0,1,3) = 0
  gppv(1,0,2,0) = (-ety(kv,jv,1)*txyddv(0,2,0)-etx(kv,jv,1)*txxddv(0
1      ,2,0))/rdj(kv,jv)
  gppv(1,0,2,1) = 0
  gppv(1,0,2,2) = 0
  gppv(1,0,2,3) = 0
  gppv(1,1,0,0) = (-ety(kv,jv,1)*txyddv(1,0,0)-etx(kv,jv,1)*txxddv(1
1      ,0,0))/rdj(kv,jv)
  gppv(1,1,0,1) = 0
  gppv(1,1,0,2) = 0
  gppv(1,1,0,3) = 0
  gppv(1,1,1,0) = 0
  gppv(1,1,1,1) = 0
  gppv(1,1,1,2) = 0
  gppv(1,1,1,3) = 0
  gppv(1,1,2,0) = 0
  gppv(1,1,2,1) = 0
  gppv(1,1,2,2) = 0
  gppv(1,1,2,3) = 0
  gppv(1,2,0,0) = (-ety(kv,jv,1)*txyddv(2,0,0)-etx(kv,jv,1)*txxddv(2
1      ,0,0))/rdj(kv,jv)
  gppv(1,2,0,1) = 0
  gppv(1,2,0,2) = 0
  gppv(1,2,0,3) = 0
  gppv(1,2,1,0) = 0
  gppv(1,2,1,1) = 0
  gppv(1,2,1,2) = 0
  gppv(1,2,1,3) = 0
  gppv(1,2,2,0) = 0
  gppv(1,2,2,1) = 0
  gppv(1,2,2,2) = 0
  gppv(1,2,2,3) = 0
  gppv(2,0,0,0) = (-ety(kv,jv,1)*tyyddv(0,0,0)-etx(kv,jv,1)*txyddv(0
1      ,0,0))/rdj(kv,jv)
  gppv(2,0,0,1) = (-ety(kv,jv,1)*tyyddv(0,0,1)-etx(kv,jv,1)*txyddv(0
1      ,0,1))/rdj(kv,jv)
  gppv(2,0,0,2) = (-ety(kv,jv,1)*tyyddv(0,0,2)-etx(kv,jv,1)*txyddv(0
1      ,0,2))/rdj(kv,jv)
  gppv(2,0,0,3) = 0
  gppv(2,0,1,0) = (-ety(kv,jv,1)*tyyddv(0,1,0)-etx(kv,jv,1)*txyddv(0
1      ,1,0))/rdj(kv,jv)
  gppv(2,0,1,1) = 0
  gppv(2,0,1,2) = 0
  gppv(2,0,1,3) = 0
  gppv(2,0,2,0) = (-ety(kv,jv,1)*tyyddv(0,2,0)-etx(kv,jv,1)*txyddv(0
1      ,2,0))/rdj(kv,jv)
  gppv(2,0,2,1) = 0
  gppv(2,0,2,2) = 0
  gppv(2,0,2,3) = 0

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gppv(2,1,0,0) = (-ety(kv,jv,1)*tyyddv(1,0,0)-etx(kv,jv,1)*txyddv(1
1  ,0,0))/rdj(kv,jv)
gppv(2,1,0,1) = 0
gppv(2,1,0,2) = 0
gppv(2,1,0,3) = 0
gppv(2,1,1,0) = 0
gppv(2,1,1,1) = 0
gppv(2,1,1,2) = 0
gppv(2,1,1,3) = 0
gppv(2,1,2,0) = 0
gppv(2,1,2,1) = 0
gppv(2,1,2,2) = 0
gppv(2,1,2,3) = 0
gppv(2,2,0,0) = (-ety(kv,jv,1)*tyyddv(2,0,0)-etx(kv,jv,1)*txyddv(2
1  ,0,0))/rdj(kv,jv)
gppv(2,2,0,1) = 0
gppv(2,2,0,2) = 0
gppv(2,2,0,3) = 0
gppv(2,2,1,0) = 0
gppv(2,2,1,1) = 0
gppv(2,2,1,2) = 0
gppv(2,2,1,3) = 0
gppv(2,2,2,0) = 0
gppv(2,2,2,1) = 0
gppv(2,2,2,2) = 0
gppv(2,2,2,3) = 0
gppv(3,0,0,0) = (-byddv(0,0,0)*ety(kv,jv,1)-bxddv(0,0,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,0,0,1) = (-byddv(0,0,1)*ety(kv,jv,1)-bxddv(0,0,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,0,0,2) = (-byddv(0,0,2)*ety(kv,jv,1)-bxddv(0,0,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,0,0,3) = (-byddv(0,0,3)*ety(kv,jv,1)-bxddv(0,0,3)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,0,1,0) = (-byddv(0,1,0)*ety(kv,jv,1)-bxddv(0,1,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,0,1,1) = (-byddv(0,1,1)*ety(kv,jv,1)-bxddv(0,1,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,0,1,2) = (-byddv(0,1,2)*ety(kv,jv,1)-bxddv(0,1,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,0,1,3) = 0
gppv(3,0,2,0) = (-byddv(0,2,0)*ety(kv,jv,1)-bxddv(0,2,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,0,2,1) = (-byddv(0,2,1)*ety(kv,jv,1)-bxddv(0,2,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,0,2,2) = (-byddv(0,2,2)*ety(kv,jv,1)-bxddv(0,2,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,0,2,3) = 0
gppv(3,0,3,0) = (-byddv(0,3,0)*ety(kv,jv,1)-bxddv(0,3,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,0,3,1) = 0
gppv(3,0,3,2) = 0
gppv(3,0,3,3) = 0
gppv(3,1,0,0) = (-byddv(1,0,0)*ety(kv,jv,1)-bxddv(1,0,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,1,0,1) = (-byddv(1,0,1)*ety(kv,jv,1)-bxddv(1,0,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gppv(3,1,0,2) = (-byddv(1,0,2)*ety(kv,jv,1)-bxddv(1,0,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)

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gppv(3,1,0,3) = 0
gppv(3,1,1,0) = (-byddv(1,1,0)*ety(kv,jv,1)-bxddv(1,1,0)*etx(kv,jv
1    ,1))/rdj(kv,jv)
gppv(3,1,1,1) = 0
gppv(3,1,1,2) = 0
gppv(3,1,1,3) = 0
gppv(3,1,2,0) = (-byddv(1,2,0)*ety(kv,jv,1)-bxddv(1,2,0)*etx(kv,jv
1    ,1))/rdj(kv,jv)
gppv(3,1,2,1) = 0
gppv(3,1,2,2) = 0
gppv(3,1,2,3) = 0
gppv(3,1,3,0) = 0
gppv(3,1,3,1) = 0
gppv(3,1,3,2) = 0
gppv(3,1,3,3) = 0
gppv(3,2,0,0) = (-byddv(2,0,0)*ety(kv,jv,1)-bxddv(2,0,0)*etx(kv,jv
1    ,1))/rdj(kv,jv)
gppv(3,2,0,1) = (-byddv(2,0,1)*ety(kv,jv,1)-bxddv(2,0,1)*etx(kv,jv
1    ,1))/rdj(kv,jv)
gppv(3,2,0,2) = (-byddv(2,0,2)*ety(kv,jv,1)-bxddv(2,0,2)*etx(kv,jv
1    ,1))/rdj(kv,jv)
gppv(3,2,0,3) = 0
gppv(3,2,1,0) = (-byddv(2,1,0)*ety(kv,jv,1)-bxddv(2,1,0)*etx(kv,jv
1    ,1))/rdj(kv,jv)
gppv(3,2,1,1) = 0
gppv(3,2,1,2) = 0
gppv(3,2,1,3) = 0
gppv(3,2,2,0) = (-byddv(2,2,0)*ety(kv,jv,1)-bxddv(2,2,0)*etx(kv,jv
1    ,1))/rdj(kv,jv)
gppv(3,2,2,1) = 0
gppv(3,2,2,2) = 0
gppv(3,2,2,3) = 0
gppv(3,2,3,0) = 0
gppv(3,2,3,1) = 0
gppv(3,2,3,2) = 0
gppv(3,2,3,3) = 0
gppv(3,3,0,0) = (-byddv(3,0,0)*ety(kv,jv,1)-bxddv(3,0,0)*etx(kv,jv
1    ,1))/rdj(kv,jv)
gppv(3,3,0,1) = 0
gppv(3,3,0,2) = 0
gppv(3,3,0,3) = 0
gppv(3,3,1,0) = 0
gppv(3,3,1,1) = 0
gppv(3,3,1,2) = 0
gppv(3,3,1,3) = 0
gppv(3,3,2,0) = 0
gppv(3,3,2,1) = 0
gppv(3,3,2,2) = 0
gppv(3,3,2,3) = 0
gpup(1,0,0,0) = (-ety(kv,jv,1)*txydud(0,0,0)-etx(kv,jv,1)*txxdud(0
1    ,0,0))/rdj(kv,jv)
gpup(1,0,0,1) = (-ety(kv,jv,1)*txydud(0,0,1)-etx(kv,jv,1)*txxdud(0
1    ,0,1))/rdj(kv,jv)
gpup(1,0,0,2) = (-ety(kv,jv,1)*txydud(0,0,2)-etx(kv,jv,1)*txxdud(0
1    ,0,2))/rdj(kv,jv)
gpup(1,0,0,3) = 0
gpup(1,0,1,0) = (-ety(kv,jv,1)*txydud(0,1,0)-etx(kv,jv,1)*txxdud(0
1    ,1,0))/rdj(kv,jv)
gpup(1,0,1,1) = 0

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gpup(1,0,1,2) = 0
gpup(1,0,1,3) = 0
gpup(1,0,2,0) = (-ety(kv,jv,1)*txydud(0,2,0)-etx(kv,jv,1)*txxdud(0
1  ,2,0))/rdj(kv,jv)
gpup(1,0,2,1) = 0
gpup(1,0,2,2) = 0
gpup(1,0,2,3) = 0
gpup(1,1,0,0) = (-ety(kv,jv,1)*txydud(1,0,0)-etx(kv,jv,1)*txxdud(1
1  ,0,0))/rdj(kv,jv)
gpup(1,1,0,1) = 0
gpup(1,1,0,2) = 0
gpup(1,1,0,3) = 0
gpup(1,2,0,0) = (-ety(kv,jv,1)*txydud(2,0,0)-etx(kv,jv,1)*txxdud(2
1  ,0,0))/rdj(kv,jv)
gpup(1,2,0,1) = 0
gpup(1,2,0,2) = 0
gpup(1,2,0,3) = 0
gpup(2,0,0,0) = (-ety(kv,jv,1)*tyydud(0,0,0)-etx(kv,jv,1)*txydud(0
1  ,0,0))/rdj(kv,jv)
gpup(2,0,0,1) = (-ety(kv,jv,1)*tyydud(0,0,1)-etx(kv,jv,1)*txydud(0
1  ,0,1))/rdj(kv,jv)
gpup(2,0,0,2) = (-ety(kv,jv,1)*tyydud(0,0,2)-etx(kv,jv,1)*txydud(0
1  ,0,2))/rdj(kv,jv)
gpup(2,0,0,3) = 0
gpup(2,0,1,0) = (-ety(kv,jv,1)*tyydud(0,1,0)-etx(kv,jv,1)*txydud(0
1  ,1,0))/rdj(kv,jv)
gpup(2,0,1,1) = 0
gpup(2,0,1,2) = 0
gpup(2,0,1,3) = 0
gpup(2,0,2,0) = (-ety(kv,jv,1)*tyydud(0,2,0)-etx(kv,jv,1)*txydud(0
1  ,2,0))/rdj(kv,jv)
gpup(2,0,2,1) = 0
gpup(2,0,2,2) = 0
gpup(2,0,2,3) = 0
gpup(2,1,0,0) = (-ety(kv,jv,1)*tyydud(1,0,0)-etx(kv,jv,1)*txydud(1
1  ,0,0))/rdj(kv,jv)
gpup(2,1,0,1) = 0
gpup(2,1,0,2) = 0
gpup(2,1,0,3) = 0
gpup(2,2,0,0) = (-ety(kv,jv,1)*tyydud(2,0,0)-etx(kv,jv,1)*txydud(2
1  ,0,0))/rdj(kv,jv)
gpup(2,2,0,1) = 0
gpup(2,2,0,2) = 0
gpup(2,2,0,3) = 0
gpup(3,0,0,0) = (-bydud(0,0,0)*ety(kv,jv,1)-bxdud(0,0,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gpup(3,0,0,1) = (-bydud(0,0,1)*ety(kv,jv,1)-bxdud(0,0,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gpup(3,0,0,2) = (-bydud(0,0,2)*ety(kv,jv,1)-bxdud(0,0,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gpup(3,0,0,3) = (-bydud(0,0,3)*ety(kv,jv,1)-bxdud(0,0,3)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gpup(3,0,1,0) = (-bydud(0,1,0)*ety(kv,jv,1)-bxdud(0,1,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gpup(3,0,1,1) = (-bydud(0,1,1)*ety(kv,jv,1)-bxdud(0,1,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gpup(3,0,1,2) = (-bydud(0,1,2)*ety(kv,jv,1)-bxdud(0,1,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gpup(3,0,1,3) = 0

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gpup(3,0,2,0) = (-bydud(0,2,0)*ety(kv,jv,1)-bxdud(0,2,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,0,2,1) = (-bydud(0,2,1)*ety(kv,jv,1)-bxdud(0,2,1)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,0,2,2) = (-bydud(0,2,2)*ety(kv,jv,1)-bxdud(0,2,2)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,0,2,3) = 0
gpup(3,0,3,0) = (-bydud(0,3,0)*ety(kv,jv,1)-bxdud(0,3,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,0,3,1) = 0
gpup(3,0,3,2) = 0
gpup(3,0,3,3) = 0
gpup(3,1,0,0) = (-bydud(1,0,0)*ety(kv,jv,1)-bxdud(1,0,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,1,0,1) = (-bydud(1,0,1)*ety(kv,jv,1)-bxdud(1,0,1)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,1,0,2) = (-bydud(1,0,2)*ety(kv,jv,1)-bxdud(1,0,2)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,1,0,3) = 0
gpup(3,1,1,0) = (-bydud(1,1,0)*ety(kv,jv,1)-bxdud(1,1,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,1,1,1) = 0
gpup(3,1,1,2) = 0
gpup(3,1,1,3) = 0
gpup(3,1,2,0) = (-bydud(1,2,0)*ety(kv,jv,1)-bxdud(1,2,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,1,2,1) = 0
gpup(3,1,2,2) = 0
gpup(3,1,2,3) = 0
gpup(3,2,0,0) = (-bydud(2,0,0)*ety(kv,jv,1)-bxdud(2,0,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,2,0,1) = (-bydud(2,0,1)*ety(kv,jv,1)-bxdud(2,0,1)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,2,0,2) = (-bydud(2,0,2)*ety(kv,jv,1)-bxdud(2,0,2)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,2,0,3) = 0
gpup(3,2,1,0) = (-bydud(2,1,0)*ety(kv,jv,1)-bxdud(2,1,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,2,1,1) = 0
gpup(3,2,1,2) = 0
gpup(3,2,1,3) = 0
gpup(3,2,2,0) = (-bydud(2,2,0)*ety(kv,jv,1)-bxdud(2,2,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,2,2,1) = 0
gpup(3,2,2,2) = 0
gpup(3,2,2,3) = 0
gpup(3,3,0,0) = (-bydud(3,0,0)*ety(kv,jv,1)-bxdud(3,0,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gpup(3,3,0,1) = 0
gpup(3,3,0,2) = 0
gpup(3,3,0,3) = 0
gpvp(1,0,0,0) = (-ety(kv,jv,1)*txydvd(0,0,0)-etx(kv,jv,1)*txxdvd(0
1,0,0))/rdj(kv,jv)
gpvp(1,0,0,1) = (-ety(kv,jv,1)*txydvd(0,0,1)-etx(kv,jv,1)*txxdvd(0
1,0,1))/rdj(kv,jv)
gpvp(1,0,0,2) = (-ety(kv,jv,1)*txydvd(0,0,2)-etx(kv,jv,1)*txxdvd(0
1,0,2))/rdj(kv,jv)
gpvp(1,0,0,3) = 0
gpvp(1,0,1,0) = (-ety(kv,jv,1)*txydvd(0,1,0)-etx(kv,jv,1)*txxdvd(0

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1      ,1,0))/rdj(kv,jv)
  gpvp(1,0,1,1) = 0
  gpvp(1,0,1,2) = 0
  gpvp(1,0,1,3) = 0
  gpvp(1,0,2,0) = (-ety(kv,jv,1)*txydvd(0,2,0)-etx(kv,jv,1)*txxdvd(0
1      ,2,0))/rdj(kv,jv)
  gpvp(1,0,2,1) = 0
  gpvp(1,0,2,2) = 0
  gpvp(1,0,2,3) = 0
  gpvp(1,1,0,0) = (-ety(kv,jv,1)*txydvd(1,0,0)-etx(kv,jv,1)*txxdvd(1
1      ,0,0))/rdj(kv,jv)
  gpvp(1,1,0,1) = 0
  gpvp(1,1,0,2) = 0
  gpvp(1,1,0,3) = 0
  gpvp(1,2,0,0) = (-ety(kv,jv,1)*txydvd(2,0,0)-etx(kv,jv,1)*txxdvd(2
1      ,0,0))/rdj(kv,jv)
  gpvp(1,2,0,1) = 0
  gpvp(1,2,0,2) = 0
  gpvp(1,2,0,3) = 0
  gpvp(2,0,0,0) = (-ety(kv,jv,1)*tyydvd(0,0,0)-etx(kv,jv,1)*txydvd(0
1      ,0,0))/rdj(kv,jv)
  gpvp(2,0,0,1) = (-ety(kv,jv,1)*tyydvd(0,0,1)-etx(kv,jv,1)*txydvd(0
1      ,0,1))/rdj(kv,jv)
  gpvp(2,0,0,2) = (-ety(kv,jv,1)*tyydvd(0,0,2)-etx(kv,jv,1)*txydvd(0
1      ,0,2))/rdj(kv,jv)
  gpvp(2,0,0,3) = 0
  gpvp(2,0,1,0) = (-ety(kv,jv,1)*tyydvd(0,1,0)-etx(kv,jv,1)*txydvd(0
1      ,1,0))/rdj(kv,jv)
  gpvp(2,0,1,1) = 0
  gpvp(2,0,1,2) = 0
  gpvp(2,0,1,3) = 0
  gpvp(2,0,2,0) = (-ety(kv,jv,1)*tyydvd(0,2,0)-etx(kv,jv,1)*txydvd(0
1      ,2,0))/rdj(kv,jv)
  gpvp(2,0,2,1) = 0
  gpvp(2,0,2,2) = 0
  gpvp(2,0,2,3) = 0
  gpvp(2,1,0,0) = (-ety(kv,jv,1)*tyydvd(1,0,0)-etx(kv,jv,1)*txydvd(1
1      ,0,0))/rdj(kv,jv)
  gpvp(2,1,0,1) = 0
  gpvp(2,1,0,2) = 0
  gpvp(2,1,0,3) = 0
  gpvp(2,2,0,0) = (-ety(kv,jv,1)*tyydvd(2,0,0)-etx(kv,jv,1)*txydvd(2
1      ,0,0))/rdj(kv,jv)
  gpvp(2,2,0,1) = 0
  gpvp(2,2,0,2) = 0
  gpvp(2,2,0,3) = 0
  gpvp(3,0,0,0) = (-bydvd(0,0,0)*ety(kv,jv,1)-bxdvd(0,0,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,0,0,1) = (-bydvd(0,0,1)*ety(kv,jv,1)-bxdvd(0,0,1)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,0,0,2) = (-bydvd(0,0,2)*ety(kv,jv,1)-bxdvd(0,0,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,0,0,3) = (-bydvd(0,0,3)*ety(kv,jv,1)-bxdvd(0,0,3)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,0,1,0) = (-bydvd(0,1,0)*ety(kv,jv,1)-bxdvd(0,1,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,0,1,1) = (-bydvd(0,1,1)*ety(kv,jv,1)-bxdvd(0,1,1)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,0,1,2) = (-bydvd(0,1,2)*ety(kv,jv,1)-bxdvd(0,1,2)*etx(kv,jv

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1      ,1))/rdj(kv,jv)
  gpvp(3,0,1,3) = 0
  gpvp(3,0,2,0) = (-bydvd(0,2,0)*ety(kv,jv,1)-bxdvd(0,2,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,0,2,1) = (-bydvd(0,2,1)*ety(kv,jv,1)-bxdvd(0,2,1)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,0,2,2) = (-bydvd(0,2,2)*ety(kv,jv,1)-bxdvd(0,2,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,0,2,3) = 0
  gpvp(3,0,3,0) = (-bydvd(0,3,0)*ety(kv,jv,1)-bxdvd(0,3,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,0,3,1) = 0
  gpvp(3,0,3,2) = 0
  gpvp(3,0,3,3) = 0
  gpvp(3,1,0,0) = (-bydvd(1,0,0)*ety(kv,jv,1)-bxdvd(1,0,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,1,0,1) = (-bydvd(1,0,1)*ety(kv,jv,1)-bxdvd(1,0,1)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,1,0,2) = (-bydvd(1,0,2)*ety(kv,jv,1)-bxdvd(1,0,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,1,0,3) = 0
  gpvp(3,1,1,0) = (-bydvd(1,1,0)*ety(kv,jv,1)-bxdvd(1,1,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,1,1,1) = 0
  gpvp(3,1,1,2) = 0
  gpvp(3,1,1,3) = 0
  gpvp(3,1,2,0) = (-bydvd(1,2,0)*ety(kv,jv,1)-bxdvd(1,2,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,1,2,1) = 0
  gpvp(3,1,2,2) = 0
  gpvp(3,1,2,3) = 0
  gpvp(3,2,0,0) = (-bydvd(2,0,0)*ety(kv,jv,1)-bxdvd(2,0,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,2,0,1) = (-bydvd(2,0,1)*ety(kv,jv,1)-bxdvd(2,0,1)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,2,0,2) = (-bydvd(2,0,2)*ety(kv,jv,1)-bxdvd(2,0,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,2,0,3) = 0
  gpvp(3,2,1,0) = (-bydvd(2,1,0)*ety(kv,jv,1)-bxdvd(2,1,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,2,1,1) = 0
  gpvp(3,2,1,2) = 0
  gpvp(3,2,1,3) = 0
  gpvp(3,2,2,0) = (-bydvd(2,2,0)*ety(kv,jv,1)-bxdvd(2,2,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,2,2,1) = 0
  gpvp(3,2,2,2) = 0
  gpvp(3,2,2,3) = 0
  gpvp(3,3,0,0) = (-bydvd(3,0,0)*ety(kv,jv,1)-bxdvd(3,0,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gpvp(3,3,0,1) = 0
  gpvp(3,3,0,2) = 0
  gpvp(3,3,0,3) = 0
  gupp(1,0,0,0) = (-ety(kv,jv,1)*txyudd(0,0,0)-etx(kv,jv,1)*txxudd(0
1      ,0,0))/rdj(kv,jv)
  gupp(1,0,0,1) = (-ety(kv,jv,1)*txyudd(0,0,1)-etx(kv,jv,1)*txxudd(0
1      ,0,1))/rdj(kv,jv)
  gupp(1,0,0,2) = (-ety(kv,jv,1)*txyudd(0,0,2)-etx(kv,jv,1)*txxudd(0
1      ,0,2))/rdj(kv,jv)

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gupp(1,0,0,3) = 0
gupp(1,0,1,0) = (-ety(kv,jv,1)*txyudd(0,1,0)-etx(kv,jv,1)*txxudd(0
1  ,1,0))/rdj(kv,jv)
gupp(1,0,1,1) = 0
gupp(1,0,1,2) = 0
gupp(1,0,1,3) = 0
gupp(1,0,2,0) = (-ety(kv,jv,1)*txyudd(0,2,0)-etx(kv,jv,1)*txxudd(0
1  ,2,0))/rdj(kv,jv)
gupp(1,0,2,1) = 0
gupp(1,0,2,2) = 0
gupp(1,0,2,3) = 0
gupp(1,1,0,0) = (-ety(kv,jv,1)*txyudd(1,0,0)-etx(kv,jv,1)*txxudd(1
1  ,0,0))/rdj(kv,jv)
gupp(1,1,0,1) = 0
gupp(1,1,0,2) = 0
gupp(1,1,0,3) = 0
gupp(1,2,0,0) = (-ety(kv,jv,1)*txyudd(2,0,0)-etx(kv,jv,1)*txxudd(2
1  ,0,0))/rdj(kv,jv)
gupp(1,2,0,1) = 0
gupp(1,2,0,2) = 0
gupp(1,2,0,3) = 0
gupp(2,0,0,0) = (-ety(kv,jv,1)*tyyudd(0,0,0)-etx(kv,jv,1)*txyudd(0
1  ,0,0))/rdj(kv,jv)
gupp(2,0,0,1) = (-ety(kv,jv,1)*tyyudd(0,0,1)-etx(kv,jv,1)*txyudd(0
1  ,0,1))/rdj(kv,jv)
gupp(2,0,0,2) = (-ety(kv,jv,1)*tyyudd(0,0,2)-etx(kv,jv,1)*txyudd(0
1  ,0,2))/rdj(kv,jv)
gupp(2,0,0,3) = 0
gupp(2,0,1,0) = (-ety(kv,jv,1)*tyyudd(0,1,0)-etx(kv,jv,1)*txyudd(0
1  ,1,0))/rdj(kv,jv)
gupp(2,0,1,1) = 0
gupp(2,0,1,2) = 0
gupp(2,0,1,3) = 0
gupp(2,0,2,0) = (-ety(kv,jv,1)*tyyudd(0,2,0)-etx(kv,jv,1)*txyudd(0
1  ,2,0))/rdj(kv,jv)
gupp(2,0,2,1) = 0
gupp(2,0,2,2) = 0
gupp(2,0,2,3) = 0
gupp(2,1,0,0) = (-ety(kv,jv,1)*tyyudd(1,0,0)-etx(kv,jv,1)*txyudd(1
1  ,0,0))/rdj(kv,jv)
gupp(2,1,0,1) = 0
gupp(2,1,0,2) = 0
gupp(2,1,0,3) = 0
gupp(2,2,0,0) = (-ety(kv,jv,1)*tyyudd(2,0,0)-etx(kv,jv,1)*txyudd(2
1  ,0,0))/rdj(kv,jv)
gupp(2,2,0,1) = 0
gupp(2,2,0,2) = 0
gupp(2,2,0,3) = 0
gupp(3,0,0,0) = (-byudd(0,0,0)*ety(kv,jv,1)-bxudd(0,0,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gupp(3,0,0,1) = (-byudd(0,0,1)*ety(kv,jv,1)-bxudd(0,0,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gupp(3,0,0,2) = (-byudd(0,0,2)*ety(kv,jv,1)-bxudd(0,0,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gupp(3,0,0,3) = (-byudd(0,0,3)*ety(kv,jv,1)-bxudd(0,0,3)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gupp(3,0,1,0) = (-byudd(0,1,0)*ety(kv,jv,1)-bxudd(0,1,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gupp(3,0,1,1) = (-byudd(0,1,1)*ety(kv,jv,1)-bxudd(0,1,1)*etx(kv,jv

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1      ,1))/rdj(kv,jv)
gupp(3,0,1,2) = (-byudd(0,1,2)*ety(kv,jv,1)-bxudd(0,1,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,0,1,3) = 0
gupp(3,0,2,0) = (-byudd(0,2,0)*ety(kv,jv,1)-bxudd(0,2,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,0,2,1) = (-byudd(0,2,1)*ety(kv,jv,1)-bxudd(0,2,1)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,0,2,2) = (-byudd(0,2,2)*ety(kv,jv,1)-bxudd(0,2,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,0,2,3) = 0
gupp(3,0,3,0) = (-byudd(0,3,0)*ety(kv,jv,1)-bxudd(0,3,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,0,3,1) = 0
gupp(3,0,3,2) = 0
gupp(3,0,3,3) = 0
gupp(3,1,0,0) = (-byudd(1,0,0)*ety(kv,jv,1)-bxudd(1,0,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,1,0,1) = (-byudd(1,0,1)*ety(kv,jv,1)-bxudd(1,0,1)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,1,0,2) = (-byudd(1,0,2)*ety(kv,jv,1)-bxudd(1,0,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,1,0,3) = 0
gupp(3,1,1,0) = (-byudd(1,1,0)*ety(kv,jv,1)-bxudd(1,1,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,1,1,1) = 0
gupp(3,1,1,2) = 0
gupp(3,1,1,3) = 0
gupp(3,1,2,0) = (-byudd(1,2,0)*ety(kv,jv,1)-bxudd(1,2,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,1,2,1) = 0
gupp(3,1,2,2) = 0
gupp(3,1,2,3) = 0
gupp(3,2,0,0) = (-byudd(2,0,0)*ety(kv,jv,1)-bxudd(2,0,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,2,0,1) = (-byudd(2,0,1)*ety(kv,jv,1)-bxudd(2,0,1)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,2,0,2) = (-byudd(2,0,2)*ety(kv,jv,1)-bxudd(2,0,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,2,0,3) = 0
gupp(3,2,1,0) = (-byudd(2,1,0)*ety(kv,jv,1)-bxudd(2,1,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,2,1,1) = 0
gupp(3,2,1,2) = 0
gupp(3,2,1,3) = 0
gupp(3,2,2,0) = (-byudd(2,2,0)*ety(kv,jv,1)-bxudd(2,2,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,2,2,1) = 0
gupp(3,2,2,2) = 0
gupp(3,2,2,3) = 0
gupp(3,3,0,0) = (-byudd(3,0,0)*ety(kv,jv,1)-bxudd(3,0,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
gupp(3,3,0,1) = 0
gupp(3,3,0,2) = 0
gupp(3,3,0,3) = 0
gvpp(1,0,0,0) = (-ety(kv,jv,1)*txyvdd(0,0,0)-etx(kv,jv,1)*txxvdd(0
1      ,0,0))/rdj(kv,jv)
gvpp(1,0,0,1) = (-ety(kv,jv,1)*txyvdd(0,0,1)-etx(kv,jv,1)*txxvdd(0
1      ,0,1))/rdj(kv,jv)

```

```

1      ,1))/rdj(kv,jv)
  gupp(3,0,1,2) = (-byudd(0,1,2)*ety(kv,jv,1)-bxudd(0,1,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,0,1,3) = 0
  gupp(3,0,2,0) = (-byudd(0,2,0)*ety(kv,jv,1)-bxudd(0,2,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,0,2,1) = (-byudd(0,2,1)*ety(kv,jv,1)-bxudd(0,2,1)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,0,2,2) = (-byudd(0,2,2)*ety(kv,jv,1)-bxudd(0,2,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,0,2,3) = 0
  gupp(3,0,3,0) = (-byudd(0,3,0)*ety(kv,jv,1)-bxudd(0,3,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,0,3,1) = 0
  gupp(3,0,3,2) = 0
  gupp(3,0,3,3) = 0
  gupp(3,1,0,0) = (-byudd(1,0,0)*ety(kv,jv,1)-bxudd(1,0,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,1,0,1) = (-byudd(1,0,1)*ety(kv,jv,1)-bxudd(1,0,1)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,1,0,2) = (-byudd(1,0,2)*ety(kv,jv,1)-bxudd(1,0,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,1,0,3) = 0
  gupp(3,1,1,0) = (-byudd(1,1,0)*ety(kv,jv,1)-bxudd(1,1,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,1,1,1) = 0
  gupp(3,1,1,2) = 0
  gupp(3,1,1,3) = 0
  gupp(3,1,2,0) = (-byudd(1,2,0)*ety(kv,jv,1)-bxudd(1,2,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,1,2,1) = 0
  gupp(3,1,2,2) = 0
  gupp(3,1,2,3) = 0
  gupp(3,2,0,0) = (-byudd(2,0,0)*ety(kv,jv,1)-bxudd(2,0,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,2,0,1) = (-byudd(2,0,1)*ety(kv,jv,1)-bxudd(2,0,1)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,2,0,2) = (-byudd(2,0,2)*ety(kv,jv,1)-bxudd(2,0,2)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,2,0,3) = 0
  gupp(3,2,1,0) = (-byudd(2,1,0)*ety(kv,jv,1)-bxudd(2,1,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,2,1,1) = 0
  gupp(3,2,1,2) = 0
  gupp(3,2,1,3) = 0
  gupp(3,2,2,0) = (-byudd(2,2,0)*ety(kv,jv,1)-bxudd(2,2,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,2,2,1) = 0
  gupp(3,2,2,2) = 0
  gupp(3,2,2,3) = 0
  gupp(3,3,0,0) = (-byudd(3,0,0)*ety(kv,jv,1)-bxudd(3,0,0)*etx(kv,jv
1      ,1))/rdj(kv,jv)
  gupp(3,3,0,1) = 0
  gupp(3,3,0,2) = 0
  gupp(3,3,0,3) = 0
  gvpp(1,0,0,0) = (-ety(kv,jv,1)*txyvdd(0,0,0)-etx(kv,jv,1)*txxvdd(0
1      ,0,0))/rdj(kv,jv)
  gvpp(1,0,0,1) = (-ety(kv,jv,1)*txyvdd(0,0,1)-etx(kv,jv,1)*txxvdd(0
1      ,0,1))/rdj(kv,jv)

```

```

gvpp(1,0,0,2) = (-ety(kv,jv,1)*txyvdd(0,0,2)-etx(kv,jv,1)*txxvdd(0
1,0,2))/rdj(kv,jv)
gvpp(1,0,0,3) = 0
gvpp(1,0,1,0) = (-ety(kv,jv,1)*txyvdd(0,1,0)-etx(kv,jv,1)*txxvdd(0
1,1,0))/rdj(kv,jv)
gvpp(1,0,1,1) = 0
gvpp(1,0,1,2) = 0
gvpp(1,0,1,3) = 0
gvpp(1,0,2,0) = (-ety(kv,jv,1)*txyvdd(0,2,0)-etx(kv,jv,1)*txxvdd(0
1,2,0))/rdj(kv,jv)
gvpp(1,0,2,1) = 0
gvpp(1,0,2,2) = 0
gvpp(1,0,2,3) = 0
gvpp(1,1,0,0) = (-ety(kv,jv,1)*txyvdd(1,0,0)-etx(kv,jv,1)*txxvdd(1
1,0,0))/rdj(kv,jv)
gvpp(1,1,0,1) = 0
gvpp(1,1,0,2) = 0
gvpp(1,1,0,3) = 0
gvpp(1,2,0,0) = (-ety(kv,jv,1)*txyvdd(2,0,0)-etx(kv,jv,1)*txxvdd(2
1,0,0))/rdj(kv,jv)
gvpp(1,2,0,1) = 0
gvpp(1,2,0,2) = 0
gvpp(1,2,0,3) = 0
gvpp(2,0,0,0) = (-ety(kv,jv,1)*tyyvdd(0,0,0)-etx(kv,jv,1)*txyvdd(0
1,0,0))/rdj(kv,jv)
gvpp(2,0,0,1) = (-ety(kv,jv,1)*tyyvdd(0,0,1)-etx(kv,jv,1)*txyvdd(0
1,0,1))/rdj(kv,jv)
gvpp(2,0,0,2) = (-ety(kv,jv,1)*tyyvdd(0,0,2)-etx(kv,jv,1)*txyvdd(0
1,0,2))/rdj(kv,jv)
gvpp(2,0,0,3) = 0
gvpp(2,0,1,0) = (-ety(kv,jv,1)*tyyvdd(0,1,0)-etx(kv,jv,1)*txyvdd(0
1,1,0))/rdj(kv,jv)
gvpp(2,0,1,1) = 0
gvpp(2,0,1,2) = 0
gvpp(2,0,1,3) = 0
gvpp(2,0,2,0) = (-ety(kv,jv,1)*tyyvdd(0,2,0)-etx(kv,jv,1)*txyvdd(0
1,2,0))/rdj(kv,jv)
gvpp(2,0,2,1) = 0
gvpp(2,0,2,2) = 0
gvpp(2,0,2,3) = 0
gvpp(2,1,0,0) = (-ety(kv,jv,1)*tyyvdd(1,0,0)-etx(kv,jv,1)*txyvdd(1
1,0,0))/rdj(kv,jv)
gvpp(2,1,0,1) = 0
gvpp(2,1,0,2) = 0
gvpp(2,1,0,3) = 0
gvpp(2,2,0,0) = (-ety(kv,jv,1)*tyyvdd(2,0,0)-etx(kv,jv,1)*txyvdd(2
1,0,0))/rdj(kv,jv)
gvpp(2,2,0,1) = 0
gvpp(2,2,0,2) = 0
gvpp(2,2,0,3) = 0
gvpp(3,0,0,0) = (-byvdd(0,0,0)*ety(kv,jv,1)-bxvdd(0,0,0)*etx(kv,jv
1,1))/rdj(kv,jv)
gvpp(3,0,0,1) = (-byvdd(0,0,1)*ety(kv,jv,1)-bxvdd(0,0,1)*etx(kv,jv
1,1))/rdj(kv,jv)
gvpp(3,0,0,2) = (-byvdd(0,0,2)*ety(kv,jv,1)-bxvdd(0,0,2)*etx(kv,jv
1,1))/rdj(kv,jv)
gvpp(3,0,0,3) = (-byvdd(0,0,3)*ety(kv,jv,1)-bxvdd(0,0,3)*etx(kv,jv
1,1))/rdj(kv,jv)
gvpp(3,0,1,0) = (-byvdd(0,1,0)*ety(kv,jv,1)-bxvdd(0,1,0)*etx(kv,jv

```



```

1  ,1))/rdj(kv,jv)
gvpp(3,0,1,1) = (-byvdd(0,1,1)*ety(kv,jv,1)-bxvdd(0,1,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,0,1,2) = (-byvdd(0,1,2)*ety(kv,jv,1)-bxvdd(0,1,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,0,1,3) = 0
gvpp(3,0,2,0) = (-byvdd(0,2,0)*ety(kv,jv,1)-bxvdd(0,2,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,0,2,1) = (-byvdd(0,2,1)*ety(kv,jv,1)-bxvdd(0,2,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,0,2,2) = (-byvdd(0,2,2)*ety(kv,jv,1)-bxvdd(0,2,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,0,2,3) = 0
gvpp(3,0,3,0) = (-byvdd(0,3,0)*ety(kv,jv,1)-bxvdd(0,3,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,0,3,1) = 0
gvpp(3,0,3,2) = 0
gvpp(3,0,3,3) = 0
gvpp(3,1,0,0) = (-byvdd(1,0,0)*ety(kv,jv,1)-bxvdd(1,0,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,1,0,1) = (-byvdd(1,0,1)*ety(kv,jv,1)-bxvdd(1,0,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,1,0,2) = (-byvdd(1,0,2)*ety(kv,jv,1)-bxvdd(1,0,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,1,0,3) = 0
gvpp(3,1,1,0) = (-byvdd(1,1,0)*ety(kv,jv,1)-bxvdd(1,1,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,1,1,1) = 0
gvpp(3,1,1,2) = 0
gvpp(3,1,1,3) = 0
gvpp(3,1,2,0) = (-byvdd(1,2,0)*ety(kv,jv,1)-bxvdd(1,2,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,1,2,1) = 0
gvpp(3,1,2,2) = 0
gvpp(3,1,2,3) = 0
gvpp(3,2,0,0) = (-byvdd(2,0,0)*ety(kv,jv,1)-bxvdd(2,0,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,2,0,1) = (-byvdd(2,0,1)*ety(kv,jv,1)-bxvdd(2,0,1)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,2,0,2) = (-byvdd(2,0,2)*ety(kv,jv,1)-bxvdd(2,0,2)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,2,0,3) = 0
gvpp(3,2,1,0) = (-byvdd(2,1,0)*ety(kv,jv,1)-bxvdd(2,1,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,2,1,1) = 0
gvpp(3,2,1,2) = 0
gvpp(3,2,1,3) = 0
gvpp(3,2,2,0) = (-byvdd(2,2,0)*ety(kv,jv,1)-bxvdd(2,2,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,2,2,1) = 0
gvpp(3,2,2,2) = 0
gvpp(3,2,2,3) = 0
gvpp(3,3,0,0) = (-byvdd(3,0,0)*ety(kv,jv,1)-bxvdd(3,0,0)*etx(kv,jv
1  ,1))/rdj(kv,jv)
gvpp(3,3,0,1) = 0
gvpp(3,3,0,2) = 0
gvpp(3,3,0,3) = 0

```

Appendix B

MACROS FOR GENERATING FORTRAN CODE

```
name(var,ii):=  
    buildq([var,ii],concat('var','d,ii));
```

```
nameu(var,ii):=  
    buildq([var,ii],concat('var','u,ii));
```

```
namev(var,ii):=  
    buildq([var,ii],concat('var','v,ii));
```

```
gensub(var):=  
    buildq([var],nvar:subst([gam  
        = gamma,j = rdj[kv,jv],mu = rrmu[kv,jv],ztx = ztx[kv,jv,1],zty  
        = zty[kv,jv,1]  
        ,etx = etx[kv,jv,1],ety = ety[kv,jv,1],'DIFF(m,zta,1) =  
roudzst[kv,jv],'DIFF(m,  
        eta,1) = roudet[kv,jv],'DIFF(n,zta,1) =  
rovdzt[kv,jv],'DIFF(n,eta,1) = rovdet[  
        kv,jv],'DIFF(e,zta,1) = roedzt[kv,jv],'DIFF(e,eta,1) =  
roedet[kv,jv],'DIFF(r,  
        zta,1) = rhodzt[kv,jv],'DIFF(r,eta,1) = rhodet[kv,jv],r =  
rho[kv,jv,1],m = rhou  
        [kv,jv,1],n = rhov[kv,jv,1],e = rhoe[kv,jv,1]],var));
```

```
unmod(varr):=buildq([varr],(gensub(varr),fortran('varr=nvar')));
```

```
outputd(var,te,ii):=  
  buildq([var,te,ii],  
    fortran(name(var,ii)=te));
```

```
outputdu(var,te,ii):=  
  buildq([var,te,ii],  
    fortran(nameu(var,ii)=te));
```

```
outputdv(var,te,ii):=  
  buildq([var,te,ii],  
    fortran(namev(var,ii)=te));
```

```
proc(var):=  
  buildq([var],  
    for ii:0 thru 3 do ( te:diff(var,q[ii]),  
                        if TE # 0 THEN (gensub(te),outputd(var,nvar,ii),  
                          apply('gradef,['var,q[ii],name(var,ii)]))));
```

```
procmu(var):=  
  buildq([var],  
    ( ii:0 , (  
      apply('gradef,['var,q[ii],name(var,ii)]))));
```

```

procu(var)::=
  buildq([var],
    for ii:0 thru 3 do ( te:diff(var,diff(q[ii],zta)),
      if TE # 0 THEN (gensub(te),outputdu(var,nvar,ii),
        apply('grader,[ 'var,diff(q[ii],zta),nameu(var,ii)]))));

procuu(var)::=
  buildq([var],
    for ii:1 thru 2 do (
      apply('grader,[ 'var,diff(q[ii],zta),nameu(var,ii)]));

procv(var)::=
  buildq([var],
    for ii:0 thru 3 do ( te:diff(var,diff(q[ii],eta)),
      if TE # 0 THEN (gensub(te),outputdv(var,nvar,ii),
        apply('grader,[ 'var,diff(q[ii],eta),namev(var,ii)]));

procuv(var)::=
  buildq([var],
    for ii:1 thru 2 do (
      apply('grader,[ 'var,diff(q[ii],eta),namev(var,ii)]));

outputad(arn,nd,ii,jj)::=
  buildq([arn,nd,ii,jj],fortran(concat('arn','p',"(",ii,",",jj,")")=nd));

```

```

arrg(arn)::=
  buildq([arn],
    for ii:0 thru 3 do(
      for jj:0 thru 3 do(
        te:diff(arn[ii],q[jj]),
        gensub(te),
        outputad(arn,nvar,ii,jj))));

```

```

arrgu(arn)::=
  buildq([arn],
    for ii:0 thru 3 do( for jj:0 thru 3 do(
      te:diff(arn[ii],diff(q[jj],zta)),
      gensub(te),
      outputbd(arn,nvar,ii,jj))));

```

```

arrgv(arn)::=
  buildq([arn],
    for ii:0 thru 3 do( for jj:0 thru 3 do(
      te:diff(arn[ii],diff(q[jj],eta)),
      gensub(te),
      outputcd(arn,nvar,ii,jj))));

```

```

outputbd(arn,nd,ii,jj)::=
  buildq([arn,nd,ii,j],fortran(concat('arn','u',"(",ii,",",",jj,")")=nd));

```

```

outputcd(arn,nd,ii,jj)::=
  buildq([arn,nd,ii,j],fortran(concat('arn','v',"(",ii,",",",jj,")")=nd));

```

```

zot(far)::=
    buildq([far],(proc(far),remvalue(far)));

zotu(far)::=
    buildq([far],(procu(far),remvalue(far)));

zotv(far)::=
    buildq([far],(procv(far),remvalue(far)));

```

```

outputgen(arn,nd,ii,jj):=
    buildq([arn,nd,ii,jj],fortran(concat('arn','dd,ii,jj)=nd'))$

outputgenpu(arn,nd,ii,jj):=
    buildq([arn,nd,ii,jj],fortran(concat('arn','du,ii,jj)=nd'))$

outputgenpv(arn,nd,ii,jj):=
    buildq([arn,nd,ii,jj],fortran(concat('arn','dv,ii,jj)=nd'))$

outputgenup(arn,nd,ii,jj):=
    buildq([arn,nd,ii,jj],fortran(concat('arn','ud,ii,jj)=nd'))$

outputgenuu(arn,nd,ii,jj):=
    buildq([arn,nd,ii,jj],fortran(concat('arn','uu,ii,jj)=nd'))$

outputgenuv(arn,nd,ii,jj):=
    buildq([arn,nd,ii,jj],fortran(concat('arn','uv,ii,jj)=nd'))$

```

```

outputgenvu(arn,nd,ii,jj)::=
    buildq([arn,nd,ii,jj],fortran(concat('arn','vu,ii,jj)=nd))$

outputgenvv(arn,nd,ii,jj)::=
    buildq([arn,nd,ii,jj],fortran(concat('arn','vv,ii,jj)=nd))$

outputgenvp(arn,nd,ii,jj)::=
    buildq([arn,nd,ii,jj],fortran(concat('arn','vd,ii,jj)=nd))$

proc2(var)::=
    buildq([var],
        (for ii:0 thru 3 do( te: diff(var,q[ii]),
            if te # 0 then (for jj:0 thru 3 do
                (tee:diff(te,q[jj]),
                    if tee # 0 then ( gensub(tee),
                        outputgen(var,nvar,ii,jj),
                        apply('gradef,[concat('var','d,ii),q[jj],concat('var','
                            dd,ii,jj)]))))))$

procmu2(var)::=
    buildq([var],
        (ii:0 , jj:0 ,(
            apply('gradef,[concat('var','d,ii),q[jj],concat('var','dd,ii
            ,jj)]))$

```

```

proc2pu(var)::=
    buildq([var],
        (for ii:0 thru 3 do( te: diff(var,q[ii]),
            if te # 0 then (for jj:0 thru 3 do
                (tee:diff(te,diff(q[jj],zta)),
                    if tee # 0 then ( gensub(tee),
                        outputgenpu(var,nvar,ii,jj),
                        apply('gradef,[concat('var','d,ii),diff(q[jj],zta
                            ),concat('var','du,ii,jj))])))))))$

```

```

proc2uu(var)::=
    buildq([var],
        (for ii:0 thru 3 do( te: diff(var,diff(q[ii],zta)),
            if te # 0 then (for jj:0 thru 3 do
                (tee:diff(te,diff(q[jj],zta)),
                    if tee # 0 then ( gensub(tee),
                        outputgenuu(var,nvar,ii,jj),
                        apply('gradef,[concat('var','u,ii),diff(q[jj],zta
                            ),concat('var','uu,ii,jj))])))))))$

```

```

procmu2uu(var)::=
    buildq([var],
        (for ii:0 thru 2 do(for jj:0 thru 2 do (
            apply('gradef,[concat('var','u,ii),diff(q[jj],zta
                ),concat('var','uu,ii,jj))]))))$

```

```

proc2vu(var)::=
    buildq([var],
        (for ii:0 thru 3 do( te: diff(var,diff(q[ii],eta)),
            if te # 0 then (for jj:0 thru 3 do
                (tee:diff(te,diff(q[jj],zta)),
                    if tee # 0 then ( gensub(tee),
                        outputgenvu(var,nvar,ii,jj),
                        apply('gradef,[concat('var','v,ii),diff(q[jj],zta
                            ),concat('var','vu,ii,jj))])))))))$

```



```

procmu2vu(var)::=
    buildq([var],
        (for ii:0 thru 2 do(
            for jj:0 thru 2 do (
                apply('grader,[concat('var','v,ii),diff(q[jj],zta
                ),concat('var','vu,ii,jj)])))))$

```

```

procmu2pu(var)::=
    buildq([var],
        (ii:0,(
            for jj:0 thru 2 do (
                apply('grader,[concat('var','d,ii),diff(q[jj],zta
                ),concat('var','du,ii,jj)])))))$

```

```

proc2pv(var)::=
    buildq([var],
        (for ii:0 thru 3 do( te: diff(var,q[ii]),
            if te # 0 then (for jj:0 thru 3 do
                (tee:diff(te,diff(q[jj],eta)),
                    if tee # 0 then ( gensub(tee),
                        outputgenpv(var,nvar,ii,jj),
                        apply('grader,[concat('var','d,ii),diff(q[jj],eta
                        ),concat('var','dv,ii,jj)])))))$

```

```

proc2uv(var)::=
    buildq([var],
        (for ii:0 thru 3 do( te: diff(var,diff(q[ii],zta)),
            if te # 0 then (for jj:0 thru 3 do
                (tee:diff(te,diff(q[jj],eta)),
                    if tee # 0 then ( gensub(tee),
                        outputgenuv(var,nvar,ii,jj),
                        apply('grader,[concat('var','u,ii),diff(q[jj],eta
                        ),concat('var','uv,ii,jj)])))))$

```

```

procmu2uv(var):=
    buildq([var],
        (for ii:0 thru 2 do(
            for jj:0 thru 2 do (
                apply('gradef,[concat('var','u,ii),diff(q[jj],eta
                ),concat('var','uv,ii,jj]])))))$

proc2vv(var):=
    buildq([var],
        (for ii:0 thru 3 do( te: diff(var,diff(q[ii],eta)),
            if te # 0 then (for jj:0 thru 3 do
                (tee:diff(te,diff(q[jj],eta)),
                    if tee # 0 then ( gensub(tee),
                        outputgenvv(var,nvar,ii,jj),
                        apply('gradef,[concat('var','v,ii),diff(q[jj],eta
                        ),concat('var','vv,ii,jj]])))))$

procmu2vv(var):=
    buildq([var],
        (for ii:0 thru 2 do( for jj:0 thru 2 do (
            apply('gradef,[concat('var','v,ii),diff(q[jj],eta
            ),concat('var','vv,ii,jj]])))))$

procmu2pv(var):=
    buildq([var],
        (ii:0 ,(
            for jj:0 thru 2 do (
                apply('gradef,[concat('var','d,ii),diff(q[jj],eta
                ),concat('var','dv,ii,jj]])))))$

```

```

proc2up(var)::=
    buildq([var],
        (for ii:0 thru 3 do( te: diff(var,diff(q[ii],zta)),
            if te # 0 then (for jj:0 thru 3 do
                (tee:diff(te,q[jj]),
                    if tee # 0 then ( gensub(tee),
                        outputgenup(var,nvar,ii,jj),
                        apply('gradef,[concat('var,'u,ii),q[jj],concat('
var,'ud,ii,jj))])))))))$

procmu2up(var)::=
    buildq([var],
        (for ii:0 thru 2 do(
            jj:0 ,(
                apply('gradef,[concat('var,'u,ii),q[jj],concat('
var,'ud,ii,jj))]))))$

proc2vp(var)::=
    buildq([var],
        (for ii:0 thru 3 do( te: diff(var,diff(q[ii],eta)),
            if te # 0 then (for jj:0 thru 3 do
                (tee:diff(te,q[jj]),
                    if tee # 0 then ( gensub(tee),
                        outputgenvp(var,nvar,ii,jj),
                        apply('gradef,[concat('var,'v,ii),q[jj],concat('
var,'vd,ii,jj))])))))))$

procmu2vp(var)::=
    buildq([var],
        (for ii:0 thru 2 do(
            jj:0 ,(
                apply('gradef,[concat('var,'v,ii),q[jj],concat('
var,'vd,ii,jj))]))))$

```

```

arrgpp(var)::=
  buildq([var],
    (for ii:0 thru 3 do(
      for jj:0 thru 3 do (te:diff(var[ii],q[jj])),
      for kk:0 thru 3 do (tee:diff(te,q[kk]),gensub(tee),
        fortran(concat('var','pp',"(",ii,"",jj,"",kk,"")"
          )=nvar))))))$

```

```

arrgpu(var)::=
  buildq([var],
    (for ii:0 thru 3 do(
      for jj:0 thru 3 do (te:diff(var[ii],q[jj])),
      for kk:0 thru 3 do
        (tee:diff(te,diff(q[kk],zta)),gensub(tee),
          fortran(concat('var','pu',"(",ii,"",jj,"",kk,"")"
            )=nvar))))))$

```

```

arrguu(var)::=
  buildq([var],
    (for ii:0 thru 3 do(
      for jj:0 thru 3 do (te:diff(var[ii],diff(q[jj],zta)),
      for kk:0 thru 3 do
        (tee:diff(te,diff(q[kk],zta)),gensub(tee),
          fortran(concat('var','uu',"(",ii,"",jj,"",kk,"")"
            )=nvar))))))$

```

```

arrgvu(var)::=
    buildq([var],
        (for ii:0 thru 3 do(
            for jj:0 thru 3 do (te:diff(var[ii],diff(q[jj],eta)),
                for kk:0 thru 3 do
                    (tee:diff(te,diff(q[kk],zta)),gensub(tee),
                        fortran(concat('var','vu',"(",ii,",",jj,",",kk,")"
                            )=nvar))))))$

```

```

arrgpv(var)::=
    buildq([var],
        (for ii:0 thru 3 do(
            for jj:0 thru 3 do (te:diff(var[ii],q[jj]),
                for kk:0 thru 3 do
                    (tee:diff(te,diff(q[kk],eta)),gensub(tee),
                        fortran(concat('var','pv',"(",ii,",",jj,",",kk,")"
                            )=nvar))))))$

```

```

arrgvv(var)::=
    buildq([var],
        (for ii:0 thru 3 do(
            for jj:0 thru 3 do (te:diff(var[ii],diff(q[jj],eta)),
                for kk:0 thru 3 do
                    (tee:diff(te,diff(q[kk],eta)),gensub(tee),
                        fortran(concat('var','vv',"(",ii,",",jj,",",kk,")"
                            )=nvar))))))$

```

```

arrguv(var)::=
    buildq([var],
        (for ii:0 thru 3 do(
            for jj:0 thru 3 do (te:diff(var[ii],diff(q[jj],zta)),
                for kk:0 thru 3 do
                    (tee:diff(te,diff(q[kk],eta)),gensub(tee),
                        fortran(concat('var','uv',"(",ii,"",jj,"",kk,"")"
                            )=nvar))))))$

```

```

arrgup(var)::=
    buildq([var],
        (for ii:0 thru 3 do(
            for jj:0 thru 3 do (te:diff(var[ii],diff(q[jj],zta)),
                for kk:0 thru 3 do (tee:diff(te,q[kk]),gensub(tee),
                    fortran(concat('var','up',"(",ii,"",jj,"",kk,"")"
                        )=nvar))))))$

```

```

arrgvp(var)::=
    buildq([var],
        (for ii:0 thru 3 do(
            for jj:0 thru 3 do (te:diff(var[ii],diff(q[jj],eta)),
                for kk:0 thru 3 do (tee:diff(te,q[kk]),gensub(tee),
                    fortran(concat('var','vp',"(",ii,"",jj,"",kk,"")"
                        )=nvar))))))$

```

```

procall(varr)::=
    buildq([varr],(unmod(varr),proc(varr),procu(varr),procv(varr),p
        roc2(varr),proc2(varr),proc2pu(varr),proc2pv(varr),
        proc2up(varr),proc2vp(varr),proc2uu(varr),proc2uv(varr),proc2vu
        (varr),proc2vv(varr),remvalue(varr)))$

```

```
procmuall(varr)::=  
    buildq([varr],(procmu(varr),procmuu(varr),procmuu(varr),procmu2  
        (varr),procmu2pu(varr),procmu2pv(varr),  
procmu2up(varr),procmu2vp(varr),procmu2uu(varr),procmu2uv(varr)  
        ,procmu2vu(varr),procmu2vv(varr)))$
```

```
arrgall(varr)::=  
    buildq([varr],(arrg(varr),arrgu(varr),arrgv(varr),arrgpp(varr),  
        arrgpu(varr),arrgpv(varr),arrgup(varr),  
arrguu(varr),arrguv(varr),arrgvp(varr),arrgvu(varr),arrgvv(varr)  
        )))$
```

APPENDIX C

MACSYMA Representation of Navier-Stokes Equations

In the following pages the MACSYMA representation for the Navier-Stokes equations is given. These are required for the inputs for the macros given in Appendix B.


```

(c1) lineal:132;

(d1)
132

(c2) derivabbrev:true;

(d2)
true

(c3) showtime:true;

(d3)
true

(c6) depends([z,m,n,e],[sta,eta]);

(d6)
[z(sta, eta), m(sta, eta), n(sta, eta), e(sta, eta)]

(c7) dahgo:true;

(d7)
true

(c8) filename(garbage);

(d8)
(garbage)

(c9) declare([q,z,g,fp,fu,fv,gv,qp,qu,gv,fpv,fuv,fvu,fvv],nonscalar);

(d9)
done

(c10) declare([gpp,gpu,gpv,gup,guv,gvu,gvv],nonscalar);

(d10)
done

(c11) depends(q,[z,m,n,e],[z,g],[q,'DIFF(q,sta,1),'DIFF(q,eta,1)]];

(d11)
[q(z,m,n,e),f(q, q_xta, eta),g(q, q_xta, eta)]

(c12) array([q,z,g],3);

(d12)
[q, z, g]

(c13) capu:stx*(m/z)+sty*(n/z);

(d13)

$$\frac{n \text{ sty} \quad m \text{ stx}}{\text{---} + \text{---}} + \frac{z}{z}$$


(c14) capv:stx*(m/z)+sty*(n/z);

(d14)

$$\frac{\text{ety} \quad n \quad \text{etx} \quad m}{\text{---} + \text{---}} + \frac{z}{z}$$


```

(c15) ratvars(eta, sta, ety, etx, sty, stx, sm, px, gam, j, e, n, m, x);

(d15)

[eta, sta, ety, etx, sty, stx, sm, px, gam, j, e, n, m, x]

(c16) p: (gam-1)*(e-z/2*((m/z)^2+(n/z)^2));

$$\frac{\frac{2}{2} + \frac{2}{2}}{\frac{2}{2}} \quad \frac{\frac{2}{2} + \frac{2}{2}}{\frac{2}{2}} \quad \frac{2}{2} \quad \frac{2}{2}$$

$$(gam - 1) (e - \frac{2}{2})$$

(d16)

(c21) tyy:2/3*mm*(2*sty*diff(m/z, sta)+2*ety*diff(n/z, eta)-stx*diff(m/z, eta)-etx*diff(m/z, eta));

$$2 \text{ mm} \left(2 \left(\frac{\frac{n}{z} \text{ sta} - \frac{m}{z} \text{ sta}}{\frac{2}{z}} \right) \text{ sty} - \left(\frac{\frac{n}{z} \text{ sta} - \frac{m}{z} \text{ sta}}{\frac{2}{z}} \right) \text{ stx} + 2 \text{ ety} \left(\frac{\frac{n}{z} \text{ eta} - \frac{m}{z} \text{ eta}}{\frac{2}{z}} \right) - \text{etx} \left(\frac{\frac{n}{z} \text{ eta} - \frac{m}{z} \text{ eta}}{\frac{2}{z}} \right) \right)$$

(d21)

(c22) txy:mm*(sty*diff(m/z, eta)+ety*diff(m/z, eta)+stx*diff(n/z, eta)+etx*diff(n/z, eta));

$$\text{mm} \left(\left(\frac{\frac{n}{z} \text{ sta} - \frac{m}{z} \text{ sta}}{\frac{2}{z}} \right) \text{ sty} + \left(\frac{\frac{n}{z} \text{ sta} - \frac{m}{z} \text{ sta}}{\frac{2}{z}} \right) \text{ stx} + \text{etx} \left(\frac{\frac{n}{z} \text{ eta} - \frac{m}{z} \text{ eta}}{\frac{2}{z}} \right) + \text{ety} \left(\frac{\frac{n}{z} \text{ eta} - \frac{m}{z} \text{ eta}}{\frac{2}{z}} \right) \right)$$

(d22)

(c24) ei:e/z-((m/z)^2+(n/z)^2)/2;

$$\frac{\frac{2}{2} + \frac{2}{2}}{\frac{2}{2}} \quad \frac{\frac{2}{2} + \frac{2}{2}}{\frac{2}{2}} \quad \frac{2}{2} \quad \frac{2}{2}$$

$$e - \frac{2}{2}$$

(d24)

(c42) txx:2/3*mm*(2*stx*diff(m/z, eta)+2*etx*diff(m/z, eta)-sty*diff(n/z, eta)-etx*diff(n/z, eta));

$$2 \text{ mm} \left(- \left(\frac{\frac{n}{z} \text{ sta} - \frac{m}{z} \text{ sta}}{\frac{2}{z}} \right) \text{ sty} + 2 \left(\frac{\frac{n}{z} \text{ sta} - \frac{m}{z} \text{ sta}}{\frac{2}{z}} \right) \text{ stx} - \text{ety} \left(\frac{\frac{n}{z} \text{ eta} - \frac{m}{z} \text{ eta}}{\frac{2}{z}} \right) + 2 \text{ etx} \left(\frac{\frac{n}{z} \text{ eta} - \frac{m}{z} \text{ eta}}{\frac{2}{z}} \right) \right)$$

(d42)

$$2 \sin m x \left(-\frac{x^2 a}{x} - \frac{x^2 a}{2} \right) + 2 \left(\frac{x^2 a}{x} - \frac{x^2 a}{2} \right) + 2 \sin x \left(-\frac{\eta a}{x} - \frac{\eta a}{2} \right)$$

(344)

$$+ \text{gam ma} ((- \frac{2}{z} - \frac{\text{sta}}{z^3} - \frac{2 m z}{\text{sta}} + \frac{2 n z}{\text{sta}} - \frac{2 m m}{\text{sta}} + \frac{2}{z}) \text{sta}$$

```
(c46) by:gam*mn/pr*(zty*diff(a1,sta)+ety*diff(a1,eta))+m/r*txy+n/r*ty;
```

[illegible]
$$+ \text{ety} (- \frac{\frac{2}{x} - \frac{2n^2 x^2}{3} + \frac{2m^2 x^2}{3}}{\frac{x^3}{3} - \frac{2m^2 x^2}{3} + \frac{2n^2 x^2}{3}} + \frac{\frac{2}{x} - \frac{2m^2 x^2}{3} + \frac{2n^2 x^2}{3}}{\frac{x^3}{3} - \frac{2m^2 x^2}{3} + \frac{2n^2 x^2}{3}}) / px$$

9